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ABSTRACT

This cost analysis model was developed for use in examining the costs of programs teaching French as a second language. Its main aim is to understand how costs are incurred, but it can be used to figure actual costs that can be used in a cost benefit analysis. The model was developed using data from two Canadian school boards that offer a variety of French programs to their students. The model recognizes that costs depend on program content, allocation of student time, pedagogical methods, delivery of content, organization of pupils, staff assignment, instructional materials, transportation, buildings and plant operation, individual support, and resource services. An emphasis is placed on the cost arising from class size, teacher salaries, busing, and curriculum materials and supplies. Class size is important because many costs--the teacher, classroom, and much curriculum material--are incurred on a per class basis. The smaller the class, the larger are per pupil costs. Because teachers' salaries are the major item on the school budget, the model includes a technique for studying the utilization of teacher time.
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A COST ANALYSIS MODEL FOR PROGRAMS IN FRENCH AS A SECOND LANGUAGE

G. L. MacNAB, Principal Investigator
J. UNITT

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Abstract

A program, defined as the knowledge and skills to be learned and the means of presenting these to the student, does not have a single cost associated with it, but rather a range of possible costs that are related to decisions about the various parameters of the program. A program is designed by specifying the time to be devoted to various subjects, the pedagogical approaches, class size, amount of teacher planning time, etc. These decisions set the values which the parameters will take for the program being designed. These values, in turn, determine costs.

Class size is important because many costs -- the teacher, classroom and much curriculum material -- are incurred by classes. These class costs are divided by its size to obtain per pupil costs and the smaller the size the larger each pupil's share. Class size can only be maintained if schools have sufficient enrolments. Offering French immersion or any other alternate program may affect class sizes by diverting enrolments. In the boards in this study, however, all but one of the small regular program schools would still have fewer than 200 students even if the alternate immersion program were not available.

Because teachers' salaries are the major item on the school budget the model includes a technique for studying the utilization of teacher time. In the schools examined, the cost of programs varied depending on the amount of planning time allotted to teachers of the program. In elementary schools, planning time for class teachers occurs when specialists teach basic French or music. The 40-minute basic French program introduced twice as much planning time as the

20-minute program. In elementary French immersion programs, the English teacher gave the French-speaking class teachers planning time which, over the grades from kindergarten to six, was about the same as the 40-minute basic program. Within schools the costs of basic and immersion French were similar, because planning time was shared among teachers. In intermediate and high schools where students rotate among teachers, planning time was given nearly equally to all teachers.

Bussing is seen as a way of gathering students to make enrolments adequate to support class size, specialists and/or a range of program offerings. Its costs, incurred on a per bus basis, will depend on the total number of children bussed and the number of riders per bus route. Although density of population is a major factor in determining bus costs, the convenience of service policies set by boards will also have large effects.

Curriculum materials and supplies tend to cost what the board policy allows them to. Although materials in French for immersion probably cost more per item, the fact that two language arts programs are offered also adds costs. Notwithstanding, the immersion school (no regular program) managed well on the same per pupil allowance as other schools (regular program and mixed) in that board. Costs of curriculum development are also examined.

Table of Contents

PART I: THE COST ANALYSIS MODEL

One: Introduction: The School System and Accountability	1
accountability	2
linking input and output	5
the school as agent	9
the model	11

Two: School and Program Parameters	17
parameters as dimensions	17
content parameters	19
delivery parameters	25
support and milieu parameters	28
interaction among parameters	33

PART II: IN SCHOOL PROGRAM COSTS

Three: Classes and Class Size	35
class defined	36
classes and costs	37
maintaining class size	40
two kinds of enrolment	45
impact of French immersion	47
summary	50

Four: A Cost Weighting Technique for Subjects	52
available instruction time	52
the teacher/class unit	56
planning time: added cost	57
teacher utilization and school size	61
salaries and costs	62
program elements	64
an example of program costing	66
cost weight factors and program planning	72
summary	75

Five: Teacher Utilization in Elementary and Middle Schools	90
school A	93
school B	101
school C	119
school D	127
school E	141
school F	157
school H	163
discussion	173

Six: Teacher Utilization in Secondary Schools	178
board policy and cost per credit	179
bilingual high schools	185
elementary/secondary comparison	188

Seven: Instructional Supplies	194
an analogy	195
board policy and budget allocations	197
comparisons of costs	205
maintenance costs	214
summary	215
PART III: SYSTEM WIDE COSTS	
Eight: Transportation Costs of Alternate Programs	219
determinants of cost	219
convenience of service	221
determining routes needed	224
bussing to alternate programs	234
summary	238
Nine: Curriculum Development	239
Ottawa curriculum development	242
Carleton curriculum development	255
rationales, parameters and cost	265
Ten: Understanding Program Costs: An Overview	273
program content and delivery	273
productivity	275
French programs and alternate programs	279
transportation	280
cost of supplies	282
curriculum development	282
conclusion	284
Summary	287
Appendix	297
References	306

List of Tables

Table		Page
1	Mean class size by school size: grades 1-6	42
2	Mean class size of schools by school size and percentage of public school children in neighbourhood taking French immersion, grades 1-6	49
3 - 7	Hypothetical school, plans A - E	79-83
8 -10	School F, 1973, cost tables	84-87
11	Salary scale for teachers	88
12	School F: Some possible alternate protram plans and costs	89
13-18	School A, 1973 and 1976, cost tables	94-100
19-24	School B, 1973 and 1976, cost tables	105-118
25-30	School C, 1973 and 1976, cost tables	120-126
31-36	School D, 1973 and 1976, cost tables	129-140
37-42	School E, 1973 and 1976, cost tables	143-156
43-45	School F, 1976, cost tables	159-162
46-51	School H, 1973 and 1976, cost tables	164-172
52	Teacher time allotted to various functions as a proportion of class instruction time, seven Ottawa-Carleton schools 1973 and 1976	174
53	Average class size in selected subjects by level and phase: secondary school R, Fall, 1976	182
54	Average class size in selected subjects by level and phase: secondary school S, Fall, 1976	182
55	Average class size in selected subjects by level and phase: secondary school P, Fall, 1976	184
56	Average class size in selected subjects by level and phase: secondary school Q, Fall, 1976	187
57	Comparison of average class size and credits per teacher by subject at four Ottawa-Carleton secondary schools, Fall, 1976	189

Table		Page
58	Budget allocation for instructional materials, Ottawa and Carleton Boards of Education, 1977 budgets	198
59	Costs of instructional supplies at an Ottawa school with two programs, 1975-76	200
60	Comparison of prices for curricular material in English and in French available for Ontario schools 1977	207
61	Comparison of prices for reference material in English and in French available in Ontario schools, 1977	209
62	Summary: Comparison of costs of outfitting immersion and regular program classrooms with books and supplies, 1976	210
63	Comparison of costs of texts for subjects offered in French and in English at a bilingual high school, Ottawa, 1976-77	213
64	Ottawa basic French: schedule of curriculum development	245
65	Ottawa basic French: cost of grade six curriculum package, spring 1977	246
66	Ottawa French immersion: schedule of curriculum development	249
67	Ottawa early entry and regular programs: cost of 16 junior science pedagogical units, 1976	250
68	Ottawa early entry immersion: cost of grade 7 and 8 curriculum guidelines for first two cohorts, 1976	251
69	Ottawa late entry immersion: cost of curriculum materials development, 1973-1976	253
70	Ottawa bilingual high school: cost of curriculum guideline development, 1974-1976	254
71	Pedagogical material developed by Carleton resource teachers, 1973-1974	258

Table		Page
72	General pedagogical material developed by Carleton resource teachers, 1975-1976	259
73	Carleton curriculum development: costs for clerical and other staff to support teachers working on materials, 1975-1976	259
74	Carleton early entry immersion: cost of writing pedagogical materials, 1975-1976	261
75	Carleton late entry immersion: cost of writing pedagogical materials, grades 7 and 8, 1976-1977	262
76	Carleton extended French curriculum development, 1975-1976	264
77	Carleton grade 9 and 10 bilingual options program: curriculum development, 1975-1976	264
78	Ottawa public school consultants in French: outline of activities	270
79	Carleton public school consultants in French: outline of activities	271
A-D	Comparison of costs of outfitting immersion and regular program classrooms with books and supplies, Ottawa, 1976	297-305
	grade two	
	grade three	
	grade four	
	grade five	

List of Figures

I	Allocation of student time in two programs	22
II	Relationship between class size and cost per pupil for selected costs per class	39
III	Average class sizes in schools of different enrolments	44
IV	Traditional school sending areas bounded by main streets with an approximate maximum walking distance depicted	223
V	A school transportation time line	225
VI	A suburban area	228
VII-XI	Bus routing with pickup points numbered	229-233
	maximum walking distance 1km 230	
	maximum walking distance 800M 231	
	maximum walking distance 600M 232	
	maximum walking distance 400M 233	
	maximum walking distance 200M 234	
XII	Distribution of student population around two schools	237

PART I: THE COST ANALYSIS MODEL

Chapter One: Introduction: The School System and Accountability

Schools have a task. They have the job of teaching children certain skills, information and understanding, that is, of presenting know-how to the children in such a way that the children will be able to learn it. Although schools, according to sociologists, have other tasks -- such as selection and certification of students for the job market and child-sitting -- their main responsibility is for the inculcation of cognitive skills and the socialization of some values. Throughout the history of schools, there has been concern with how well they performed their task, and recently this concern seems to have become keener.

This concern may be related to the rising cost of education. Schooling is labour intensive. The transfer of know-how to young human beings seems to depend on having other humans as teachers, and it seems to be a task that cannot be made shorter or easier or quicker by the use of capital goods to replace human teachers. Because formal education depends on teachers, school costs tend to rise with the price of labour, with no compensatory improvement in the productivity of that labour which the use of capital equipment may bring. Indeed, the current demand for smaller classes and more student services (psychologists, remedial teachers, guidance personnel and the like) leads to labour being less productive in terms of the number of children processed -- although greater learning on the part of each child is said to result.

ACCOUNTABILITY

Increased costs lead to a demand that schools be held accountable for the achievement of the teaching task. To be accountable is to be able to show that the resources provided were wisely used to produce the results desired. On the one hand the schools must show that the skills, information and understandings desired were developed in the children being taught. On the other hand, the schools must indicate that the money and personnel provided were effectively and efficiently used to achieve this transfer of know-how. Because of this double demand, accountability is very difficult to achieve.

Benefits

In the first place, there is much controversy over what skills, what knowledge, what understandings the schools ought to inculcate. For example, to what extent should the schools teach values, and what values ought the schools to teach? Even within a limited cognitive area such as mathematics there is argument over whether set theory, the multiplication tables or practical accounting should be parts of the curriculum.

After agreement has been reached on what should be taught, there are prickly problems of measuring whether it has been learned. First, there is the problem of devising tests which are fair and which accurately measure the learning of what has been taught. Second, there is the problem of relating the measured knowledge to what the child already knows, and to his abilities. If the child knows something before the teaching begins, or learns it outside school, the learning cannot be credited to his schooling. On the other hand, the school probably should get more credit for teaching a dull child something than for teaching the same thing to a bright child.

The problems of measuring benefits are difficult enough when the question asked is 'Did the child learn X in this program?' When the question is 'What all did the child learn in this program?' or 'Did he learn more (or more X) in this program than he would have if he had taken the other program?' it may be impossible to answer.

Many schemes to make schools accountable get hung up on the problems of what the benefits are and how to measure them. Sometimes the objectives are reduced to small bits of information, the learning of which can be measured, but such objectives look only at the trees and miss the forest. If these evaluation results are unfavourable to a program, its supporters can honestly argue that it achieves 'other things' for children (such as teaching creativity) which have escaped the measures. The point is especially important when one recalls that the schools do teach things inadvertently. For example, the inadvertent teaching of sexual and racial stereotypes has been documented (McDiarmid and Pratt, 1971), and there is support for Rosenthal and Jacobson's work (1968) indicating that poor self-definitions are taught to some students (Rosenthal, 1973).

Resources

The costs of school programs may be divided into the resources which are directly expressable in dollar terms and those which may not be expressed in monetary terms.

The schools are supported by tax dollars which buy such things as books, school buildings and busses, and the services of teachers, librarians, secretaries, janitors, bus drivers, psychologists and directors of education. These are the economic resources which the society makes available to the schools so that they may perform their tasks. It is these resources with which this costing model will be concerned.

The model assumes that the administrators must make many decisions about the contents to be taught, about how these contents are to be put across to students, and about the operation of the school organization and physical plant. Some things, for instance the number and ages of children in a school district, are the 'givens', or the conditions within which decisions must be made. The cost analysis model is concerned about the dollar costs incurred as a consequence of these decisions and conditions.

It must be remembered, however, that dollars, and the goods and services that can be purchased with dollars, are not the only costs that are related to these decisions. Decisions may enhance or diminish community or parental support for the schools, or teacher morale. In this context the economic idea of opportunity costs is useful. A decision to do one thing usually is also a decision not to do something else. The benefits which might come from doing the 'something else' are therefore lost by the decision to do the 'one thing'. For example, a decision to close a school in which enrolment has declined implies forgoing the benefits of that neighbourhood school and may mean losing neighbourhood support. On the other hand, keeping it open implies adding dollar costs or curtailing programs for these students. Alternatives have different consequences in terms of educational benefits, continuing community support and staff morale, as well as financial costs. The dollar costs of doing things one way rather than another must be weighed against the other costs as well as the benefits of the alternatives.

This report will address itself to problems of costs, rather than benefits. A model to understand costs is useful in its own right, but it is especially useful if it can be used to relate costs to benefits. Because the measurement of total benefits is so difficult the model

should lend itself to examining costs of limited groups of benefits in a way that will produce data that are not distorted by the mere fact that they are incomplete and partial.

LINKING INPUT AND OUTPUT

It is obvious that students are not taught by money but rather by the things -- such as books and teachers -- that money buys. The schools take the resources given and transform them into the teaching organization that produces the effects desired in children. In this way the schools are agents of society, acting on the resources society provides for education, transforming them, and bringing them to bear on the student.

Most studies of costs and benefits assume that there is some linear relationship between resource input and learning output. In other words, these studies assume that adding one unit of some input, say dollars, will lead to an increment in average student learning of a certain amount. Regression analysis is the usual statistical technique used to relate inputs and outputs. This technique, which has a long history in economics, became popular in educational research with studies of educational opportunity in the United States (Coleman, 1966; Averch, 1972; Katzman, 1971; Murnane, 1975; Sewell, et al, 1969, 1970). 'When these techniques are successful it is possible to estimate changes in levels of the different outputs that will result from a change in the level of a given input' (Murnane, 1975:5).

It should be noted that what is explained by regression analysis is not levels of achievement but variations in levels of achievement among the units (students, classes or school systems) used in the analysis. Outputs have generally been measured by standardized tests of cognitive achievement or by output levels such as years of schooling (Averch, 1972:35).

Similarly, variations in inputs, rather than input levels, are expected to do the explaining. Inputs have included both costable and non-costable resources. Most prominent of the non-costable resources are a variety of student characteristics including ability, socio-economic status variables (parental occupation and education, family income), race, neighbourhood housing values, and peer group influences. These have generally been found to explain the largest proportion of outcome variation (Averch, 1972:45-46). School-related variables also may include non-costable inputs, such as teacher quality as measured by principals' ratings or verbal ability, and school district size.* Other inputs are technically cost-related, but are not practically costable, such as age of buildings. Costable school inputs typically include teacher salary levels, teachers' education and experience, class size, pupil-teacher ratio, pupil-administration ratio, number of library volumes per student, and gross measures of dollar input such as per pupil expenditure. These variables are sometimes considered as proxy measures for 'quality of education.'

School-related variables typically do not explain nearly as much of the variance as student variables, and furthermore they are not reliably related to outcomes across studies: those inputs found significant in one study are not found significant in another (Averch, 1972:44-45). Thus, the most important explanatory inputs were not the resources given the schools to work with, but rather characteristics (such as ability or socio-economic status) of the students which the schools are expected to work on. Richer (1975:383) notes, 'The absence of consistent faculty and staff effects (as measured in these surveys) on cognitive achievement is taken as evidence that schools in general

* School district size is also used as a proxy for economics of scale. See Katzman, 1971:88-89.

have little effect on cognitive growth.' However, Richer concludes that this inference is untenable:

...to suggest, as some have done, that schools have no effects is ludicrous. It has only been shown that particular school factors have null effects vis-à-vis particular output measures. It remains for us to discover the salient dimensions. (1975: 398)

Several reasons have been suggested for the failure of regression analysis to indicate the dimensions of schools that are salient in producing achievement effects. One reason may be that regression techniques do not address themselves to the overall level of achievement, and, thus, the contribution of schools to the general achievement of literacy is overlooked. Cross-national research, which often uses these same techniques, does indicate that schooling is related to general levels of literacy, and one study (Kohlberg, 1971:1065-66) indicates that urban, educated populations have higher proportions of adults with conceptual thinking skills than do uneducated village populations. High rates of literacy and of other skills produced by educational systems upgrade the labour force and produce 'human capital' which is an asset in industrialization (Vaizey, 1973; Vaizey and Debeauvais, 1961; Anderson, 1967; Drucker, 1961; Blaug, 1970:61-100). These international studies suggest, therefore, that the failure of intra-national studies to find school effects may be related to the relatively small variation in resource input to schools or in school output within an industrialized nation such as Canada or the United States. Although these do vary by region, such variation is relatively unimportant when considered against the fact that almost all children in every region receive formal instruction for four or five hours a day through nine or ten months of the year.

Another reason has to do with the assessment of school-induced learning. It is assumed that students with less favourable characteristics (e.g., low socio-economic status) probably have to learn 'more' and be taught 'harder' to achieve the same level as other students. However, there is really no baseline for measuring either total learning -- gain scores are notoriously unreliable (Cronbach and Furby, 1970) -- or for sorting out the learning which results from schooling. Teaching effort is equally, or perhaps even more difficult, to determine. Thus, the apparent lack of school effects may really be measurement problems: the more easily measured variation in extra-school effects (see Jenks, 1972) overpowers the variation in either amount of school learning or school effort which can be reliably measured (Werts and Hilton, 1977). The methodology of the regression studies has been debated both with respect to its logic and its techniques (Coleman, 1975; Mosteller and Moynihan, 1972) without really coming to grips with the issues involved in the assessment of the type of school variables necessary to explain incremental amounts of learning for students who start off knowing different amounts of different things.

Traditionally, failure of regression functions to find consistent links between input and output is blamed on incorrect specification of inputs, outputs or both. No further comment is needed here about problems in delineating and measuring outputs. In various studies input specification has been criticized for lack of inclusiveness, lack of control for interaction among student characteristics (especially socio-economic status) and other inputs, and inappropriate units of analysis (i.e., whether students, classes, schools or school districts). All of these may be seen as symptoms of a deeper kind of lack which is probably inherent in input-output analysis. Its basic assumption is that total inputs are tied to total outputs in some fairly simple way.

It assumes that the processes which turn input into output are not really important to the efficiency of the operation, and that differences in the ways in which schools organize their resources and bring them to bear on students are not essential to specifying the input-output equation.

When process variables are used, they enter the equation as another 'input' rather than as variables which transform input-output relationships. Class size or pupil-teacher ratio (these are not the same) are most often the process variables entered into the equation in this way.

Yet education, at its simplest, involves input-output transfers among systems of three different types: information systems (subject matters and pedagogy), psychosomatic systems (students and teachers), and socio-economic systems (school organizations and communities). It should not be surprising that a technology developed to deal with inputs and outputs measurable in dollars is inadequate to deal with inputs, outputs, and throughputs (as Herriott and Hodgins, 1973, call students) which are costable and non-costable, tangible and intangible, sentient and insentient.

THE SCHOOL AS AGENT

This paper argues that a school organization is a homeostatic system which reacts to inputs, whether resource levels or student characteristics, and seeks to achieve from them what it defines as the maximum output possible. Taken out of sociological jargon, this means simply that teachers and principals and janitors seek to do the best they can (or think they can) with what they have.

It is important to see a school system in human terms because it is as an organization of human beings -- what Homans (1950) called the human group -- that the school works toward its goals. In saying this we imply that the members of the teaching organization pursue

educational goals in a rational manner, making best use of the means at hand to teach their students the skills, information and understanding desired (Weber, 1964). This rational, task-directed orientation is certainly a salient feature of schools, but it would be a serious mistake to think that it was the only aspect to be considered.

Like all human groups, some of its resources and energies will be spent maintaining the organization and an esprit among members. Such an allocation is not necessarily a diversion of resources from the teaching task, since the organization is, itself, the means of bringing resources to bear on the task. Thus, energy directed toward the group may be indirectly used for task achievement.

On the other hand, as Halpin and Croft (1962) indicate, group feeling may be merely an intimacy among group members that is not related to the task of learning. Because of the difficulties of evaluating either teaching effort or the learning result, schools may be especially vulnerable to the diversion of resources into organizational elaboration. The ambiguousness of the student role -- as raw-material-to-be-taught, as temporary member, and as client (or child of clients) -- taken together with the professionalization of the teacher role leave the permanent members of the system to a great deal of freedom to divert resources to organizational 'needs'.

Another limitation on the rationality of schools is the simple fact that they are composed of humans and humans are by nature psychological as well as logical. That is to say, many actions are not the rational using of means to reach school goals, but are determined by personal goals that should be irrelevant to the teaching organization, and by other psychological events.

These limitations notwithstanding, the schools tend to act as if they were rational, bureaucratic organizations in Weber's sense (1964). School members do take actions to achieve educational goals and do

respond to complaints that goals are not achieved or that the organization is inefficient. These are not, however, mechanical responses, but rather homeostatic responses designed to maintain the smooth operation of the teaching organization and to defend it against external threat. Members respond by various compensatory adaptations, substitutions, temporary expedients and contrivances; by hoarding against rainy days and eking out when materials or labour are in short supply; and, in the last resort, by shifting responsibility and changing goals that cannot be achieved or are too costly (Wildavsky, 1976). Whether any given set of inputs is adequate or not will depend in large part on the knowledge, adaptability, willingness and cleverness of the members of the organization using them.

In the schools examined for this study, principals (and the two boards) perceived problems differently and used resources in different ways to achieve goals which sometimes differed in emphasis. This report will examine some of these differences and will argue that they are vital in determining the efficiency and effectiveness of schools.*

THE MODEL

The cost analysis model (CAM) says that costs are incurred by the operation of the school organization as it goes about its business of providing teaching and other services to the students in its care. The costs are incurred because there are teachers and typists and janitors and superintendents to be paid, buildings to be heated and busses to be run. Many, indeed, most of these costs are incurred by the schools independently of what knowledge is taught or learned.

* There is probably a threshold effect for input, such that input levels below the threshold will be inadequate no matter how clever the principal or how much eking out members are willing to do.

The level of cost depends on decisions about the amount of space necessary to house a certain number of pupils, the temperature that is appropriate for teachers and students to work in, the kind of records that are to be kept on students, how frequently a building should be painted, and the number of students for which a teacher should be responsible. Some costs of running schools depend on decisions made in the past which are not easily changed. For example, the type of construction and layout of a school will affect heating costs.

The things about which decisions must be made -- things like class size and building temperatures -- we will call parameters. Each parameter is one of a set of properties whose values determine the characteristics of the program or of the school and its organization. A decision is the choosing of the value which the parameter will have for this school or that program. The administrator may decide to have classes of 25 or classes of 30 or to divide the enrolment among 10 classes and let class size follow from that; he may decide to have the thermostats set at 18° C or at 21° C or to let the teachers set their own thermostats. He may make a decision because he believes it will help to produce the learning that is wanted, or will keep the teachers from griping, or will keep him within his budget, or will save money to spend on a pet project, or will accomplish all these good goals at a stroke, or because that is the way things have always been done.

The model of cost analysis presented here assumes that it is the decisions about parameters which determine the costs of running the school and presenting programs to the students. The model examines how the parameters are related to cost, how much more one decision will cost than another. To understand how they are related to cost, the model also considers the relationships among parameters. It is the case that each decision is likely to affect other decisions, limiting or determining the values that may be chosen for some other parameters.

Parenthetically, it should be noted that there are some parameters relevant to school costs whose value is given by the real situation. For example, the administrator cannot choose how many students will live in his district or what their ages are. These are conditions under which he operates and which will affect costs and the parameter values which he may choose.

The cost analysis model also assumes that decisions about parameter values may have consequences for the learning that takes place in a school and for the operation of the school organization. Because parameter values can be varied, the effects of many decisions can be empirically studied, thus enabling the benefits to be measured.

It should be noted, however, that there is no reason to suppose that the parameters that are most costly are necessarily those which have the greatest educational benefits. Indeed, it appears that only some parameters incur costs (or incur costs that are proportional to the values of the parameter) and that these may not be features of the school system which affect learning outcomes.

The looseness of the connection between costs and learning is not difficult to understand if we discard some of the conventional wisdom about schools. Schools were established to encourage the production of information, skills and understanding, especially literacy. To accomplish this task on a broad scale, it seemed necessary to gather together groups of pupils, in whom the knowledge was to be produced, so that they could be subjected to the teaching which was to achieve this end. This gathering and teaching meant the establishment of schools as institutions -- that is, the appointment of a teacher, the providing of a classroom and the equipping it with blackboards and books. Thus, even before the pupils entered the 'school', certain costs were incurred, costs which must be divided among however many

students form the group to be taught. The cost per 'bit' of student learning (if human learning can be measured as precisely as information) will vary, depending on these initial costs, the number of students among whom the costs are divided, the capacity of these students to absorb bits of information, and the ability of their teacher to induce learning.

Thus the major costs of schooling are not those of imparting knowledge, but rather those incurred by the gathering of students into one place and away from the rest of society, an activity which is ostensibly merely a preliminary to the main task. Boulding (1972) has noted that one of the products of schools is a 'custodial service or "childsitting"'. Although recognizing that 'knowledge and skills may be regarded as the most legitimate products of schooling', Boulding contends that 'the actual economics of the schooling industry may be more closely related to this (custodial) by-product than to its main products of knowledge and skills' (1972:131-132). Whether considered as a useful* product or merely as a pre-condition to performing its main task, the gathering and holding of students away from society consume a lion's share of the educational dollar.**

Furthermore, the institutionalization of education weakens the link between costs and learning because any organization tends to draw resources unto itself and to resist losing inputs already received or pledged. Schools are no exception. The result of this process in schooling is seen in today's bureaucratic organizations -- with their

* While arguing that this custodial service 'releases parents for productive activity of some kind', Boulding also contends that the segregation has resulted in a youth culture and a generation gap, which may be 'quite undesirable' (1972:132).

** It also sets limits on the range of possible educational structures and activities.

large administrative branches, negotiated employee contracts, and investments in buildings and real estate -- which tend to carry on almost independently of students, as may be seen by the difficulty school establishments have in shrinking to fit declining enrolments.

Because an organization must be established to perform the teaching task, because the gathering and holding of students precede the actual instruction, and because costs are largely associated with these aspects of schools, the costs of actually imparting knowledge tend to appear almost incidental. A great deal of teaching can occur at no, or very little, extra cost once the costs of placing the students in the custody of a teacher have been paid. Having custody of students provides the school organization with the basic conditions for teaching. Above this level, refinements in content of information provided, pedagogical methods, and quality of staff may be provided with small increments in cost.

The cost analysis model attempts to determine what parameters have implications for costs and to specify the functions between costs and these cost-relevant parameters. As a model, its main aim is to understand how costs are incurred by teaching organizations, but it should also be able to generate actual costs, which can be used in a cost-benefit analysis.

The model has been developed for use in examining the costs of programs teaching French as a second language and most examples will emphasize these programs. The model was developed using data from two school boards in the National Capital Region which offer a variety of French programs to their students. As taught at these boards, the French programs have the peculiarity that French language arts and English language arts are never taught by the same person. However, other subjects may be taught in either language, depending on the

program, by the teacher who instructs language arts in that language, or by a specialist in the subject area. Because of this use of specialists, the model lays a great deal of emphasis on teacher utilization, which may not be important in elementary schools where a single teacher instructs a class in all subjects. With this possible exception, we believe that the concepts and relationships discussed here should be of interest to trustees and school administrators generally.

Chapter Two: School and Program Parameters

Most approaches to costing school programs assume that costs are associated with getting certain bits of information into students' heads. That is, they assume that programs with particular learning expectations have a price associated with them. The cost analysis model disagrees. *Costs are not intrinsic to a program or to a curriculum, but rather are associated with the organization of people and materials which present the curriculum to the students.* They depend on choices made about the personnel and their utilization, learning materials, classroom space, class size, administrative support, curriculum development, bussing, program location, etc. They also depend upon conditions outside the school such as number of children living in a school sending area, density of student population and declining birth rates.

PARAMETERS AS DIMENSIONS

Schools and school programs may be described by a number of parameters. Each parameter is one of the set of properties whose values define the characteristics of the program or school milieu. The parameters are dimensions along which schools and their programs vary. These dimensions provide the framework for analysing the schools. All schools or school programs may be described by the same parameters, although the value any program takes on a parameter may be unique. Some parameter values may be chosen, as when decisions are made about time allocation to various subjects, pedagogical approaches and modes

of teacher-student assignment (e.g., rotary).^{*} The values of other parameters are given by conditions outside the school system. For example, enrolment depends on the number of children living in the district. There are a very large number of parameters and a taxonomy of parameters would indicate not only major categories, but also that they could be specified in finer and finer detail.

Decision-making consists of choosing the values that various parameters will take in this school for this program. These choices are made by school boards, principals, teachers and curriculum designers as part of a rational decision-making process aimed toward certain student learning. They specify the parameter values which are expected to reach the learning goals. They may be directly related to the learning goals (e.g., allocating more student time to subjects in which more learning is desired) or they may be properties of the organization or physical plant whose contribution to learning is less direct. Decisions about parameter values tend to follow the school hierarchy: The board and senior administrators specify value ranges of major parameters and detailed implementation of these decisions takes place through choices within these ranges at the school or classroom level.

In other instances, however, parameter values are scarcely 'chosen' at all, but are simply 'the way things are done around here', compromises among personalities, or spinoffs from other decisions. The creation of teaching organizations and designing of programs are not entirely intentional, rational, goal-oriented processes.

* The model assumes only that when there are alternatives, choices or 'decisions' among these alternative parameter values *could* be made rationally, with goals in mind. It does not assume that decision-making processes are always, or even usually, rational, although it may aid rational processing by indicating the cost of such choices.

The cost analysis model finds it useful to distinguish three types of parameters which correspond to aspects of the school as a teaching organization: These are program parameters, delivery parameters, and support and milieu parameters.

Content Parameters

Program parameters describe the learning objectives or content to be learned, the allocation of student time to achievement of the objectives, and the learning sequence, methods and activities which will be used in teaching the content.

The model assumes that a program is designed to fill all the student time available for instruction and that this program is the message -- the curricula, the knowledge -- that the educational system wants to impart to the student. It consists of information and skills in various subject areas which a student is invited to learn, together with a methodology by which these are to be presented, geared to the amount that a student can be expected to learn in that portion of the instruction time allocated to each subject. The program may be thought of as the blueprint for the school's activities in teaching the child.

The parameters which are properties of programs may be categorized as relating to content -- that is, to decisions about *what* is to be learned; to allotments of student time -- that is, to decisions about *when* and in what sequence the content is to be learned; and to pedagogical methods -- that is, to decisions about *how* to induce the learning. Obviously, these decisions are not independent of one another.

Content parameters will indicate what subjects are to be taught (for example, is French to be included?), and the relative importance of the various subjects (is reading more important than history?). The content parameters also include specification of the aspects to

be learned within each subject (the curriculum) and ideally would indicate ways that aspects of various subjects could be braided together. An illustration of such intertwining would be where mathematics problems in fractions and measurement were taught by means of adapting recipes for larger or smaller groups in home economics. In the present context, of course, the use of French in teaching other subjects is a preeminent example of such dual purpose teaching.

Content parameters must also place the learning in a long-term frame of reference. To understand what this means, we must digress to consider more carefully what is meant by program. Heretofore, we have spoken of a program as the total information, skills and understandings which a child is expected to be taught in school, together with the activities and pedagogical approaches used in the teaching. Such a definition makes no reference to the length of time over which the teaching and learning are to occur. It could be a day, a school year, or all the 12 or 14 years of schooling. Practically, for costing, we tend to think in terms of a school year, since school schedules seldom hold still for longer than that. However, many skills take several years to learn and programs are designed to build on what a child may be expected to have learned earlier. Thus, the parameters of any year's program will have to include the nature of the long-term learning sequence of which it is a part.

For example, we may consider two grade 7 programs, which each contain French language arts and social studies, art and music taught in French, making up approximately half the program. The programs will have different contents (and methods) if one occurs after full immersion in French from kindergarten to grade 6 and the other is the beginning of a semi-immersion experience which may end in grade 9 or

continue through high school. Traditionally, primary or elementary school programs provide basic general educational skills and specialization begins at the secondary level. The introduction of alternative programs, such as those beginning immersion in a second language in kindergarten, has brought to the fore the issues of placement of content in long-term sequences and made these parameters salient in describing programs.

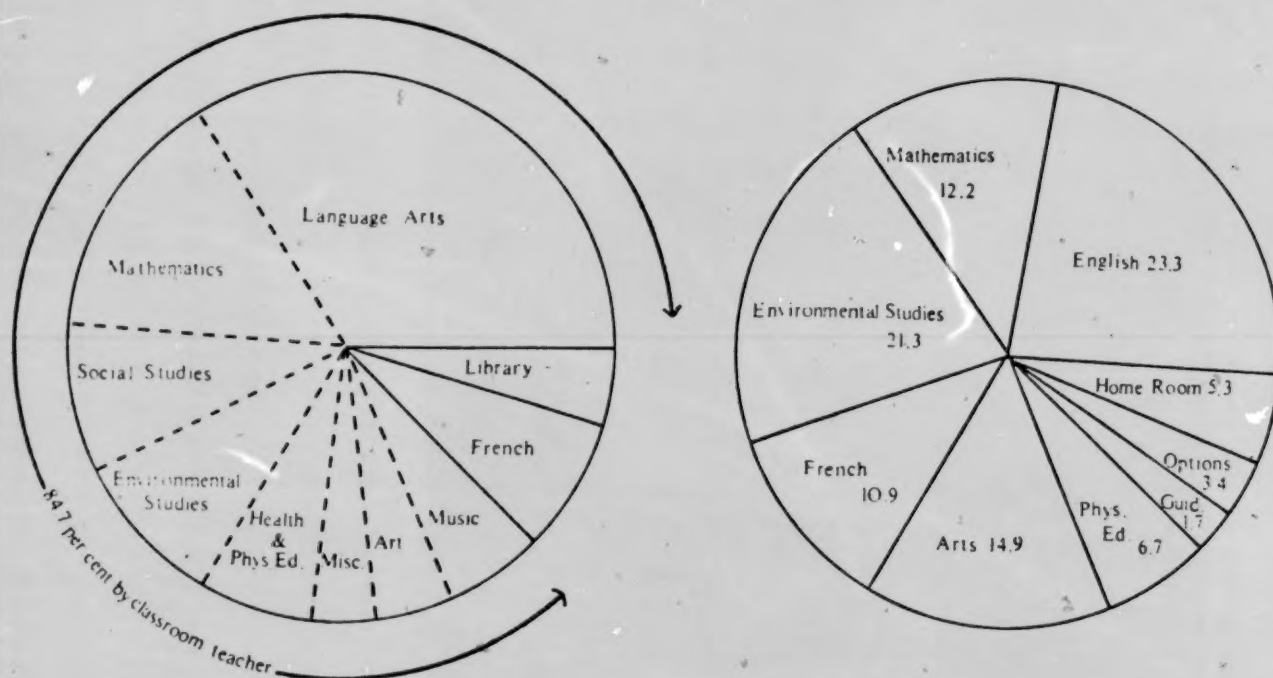
The *allocation of student time* flows from the delineation of content and setting priorities. The time to be allocated is the available instruction time. Children are in school for a certain amount of time each day, some of which is spent on recess, lunch, changing classes and other non-instructional activities. There is only a certain amount of time available when children may receive instruction. This time must be allocated to the learning of various subject matters. The amount and proportion of time allocated to each subject constitute parameters of the program (see Figure I).

In general, it is assumed (after Carroll, 1963) that the allocating of more time to a subject will result in greater learning. Hence, subjects usually will receive time allocations in proportion to their importance. However, because some learnings may be easier and consume less time than others, and because dual-purpose learning situations can be arranged, subjects will not always accumulate time in exact proportion to their importance. This exception notwithstanding, it will usually be the case that there is considerable correspondence between content value parameters and the amount of time allocated various subjects.

The sequence in which contents are presented for learning may also alter this equation. It appears that students must learn learning

FIGURE 1

ALLOCATION OF STUDENT TIME IN TWO PROGRAMS



strategies, and so earlier learnings may take more time than later work (see Bloom, 1974). Thus, the total amount of time which needs to be accumulated in order to learn something will be affected by its place in the order of learning tasks and the age at which the child starts to learn it.

Pedagogical methods are the means selected to put the content message across to the student. They delineate the approach taken to the subject matter and describe the activities of teachers and students which are expected to lead to learning. Although they are often subtle, these parameters are probably the most significant in determining how effective a program will be. They define teaching strategies, including the means of evaluating a student's learning, and feeding this information back to the student. Pedagogical variables can usually be manipulated by the administrator only indirectly, through the teacher in the classroom. Even where he has more direct control, as in the selection of curriculum material, the effect of decisions will be modified directly by the teacher in his interaction with the students.

Some of these methodological parameters are associated with particular materials -- for example, the use of Cuisenaire rods in teaching arithmetic or the use of a film to make a point in a health unit -- and so have costs associated with them. Other pedagogical parameters are, or may be, independent of materials -- the use of lectures rather than discussions, for example -- and so decisions about them will not influence costs. Often the costs are substitution costs -- the difference in the prices of texts which are more and less teacher dependent -- or sunk costs -- as when busses and drivers which are employed to transport pupils to and from school are also used to take classes to museums or when special gym equipment or an auditorium are used simply because they are available in the school.

A listing of some program parameters which are relevant to the teaching of French will indicate and illustrate the type of dimensions which come under this rubric:

Content (What):

1. Priority listing of linguistic skills, attitudes and cultural knowledge to be taught. Objectives in all three areas have been proposed, but any particular program may promote one more than another.
2. Specification of the relative importance of linguistic skills of reading, writing, speaking or listening. A particular program may consider some more important than others, or may consider some as end objectives and others as ways of getting there.

Time allocation (When):

1. Sequence of learning: The order of presentation of elements to the students. Are phonics to be taught before or after structures? When is formal grammar to be introduced?

Pedagogical methods (How):

1. Amount of mother tongue (either oral or in print) allowed in the French classroom.
2. The extent to which the learner must depend on the teacher to continue to work on the task.
3. The decision of whether French is taught as a 'language art' or used as a medium of instruction.
4. Choice of text and other curricular material.
5. Selection of evaluation technique, e.g., of a paper-and-pencil test or an oral evaluation by the teacher, etc.

Although this listing is partial and merely illustrative of program parameters, it does indicate that *these parameters do not contribute greatly to cost differences among programs*. Only the choice of text and materials and the evaluative technique (since extra staff might be needed to listen to oral examinations) would seem to incur costs.

In this paper no attempt has been made to delineate all the program parameters, although the costs of materials and of curriculum development have been studied (see Chapters Six and Nine). Except for the materials used, the defining of relevant pedagogical variables is more relevant to evaluation of benefits than to costing and the categories would be more fruitfully delineated with respect to evaluation demands.

Delivery Parameters

Once a program has been developed, it must be presented to the students. Usually this presentation is done by a teacher with the help of various materials such as textbooks, audio-visuals and other teaching aids. The major costs of the schools are those of putting the teachers and teaching materials into contact with the students during the time allocated for instruction. To accomplish this task, classes of students are formed and teachers are assigned to instruct these groups.

Delivery parameters describe the organization of students to receive instruction, the assignment of teachers to give instruction and the making available of instructional materials to the students. The characteristics by which children are sorted into classes and class size are parameters of student organization that effect costs by affecting how effectively other resources can be used. Giving planning time to teachers or assigning them to teach part classes are also cost-related parameters. The cost of instructional materials varies depending on the purchase price per unit and also on whether the material is consumable or permanent, and given to every student or available only for use on a round-robin basis.

The *organization of pupils* into classes fills the gap between the individual needs of children and the school's need to deal with many more children than there are adults to teach them. Children are sorted by age, ability, and/or other characteristics into groups which are expected to learn similar program messages. The characteristics used to sort children into classes, the extent to which these categories are similar and may be combined, and the size of the class are major parameters of student organization within schools. Since many costs are incurred on a per class basis, the size of the class is a major factor in determining costs. The classes, in turn, are gathered together into

groups called schools. Although they usually relate to more than one program (and so are not delivery parameters), the parameters associated with this larger grouping of students and with the fit between class groupings and school size are also important to costs. These class size issues will be discussed in Chapter Three.

Staff assignment. Since all students must be the responsibility of a teacher at all times during the instructional day, staff must be assigned to teach the program to student groups throughout this time. Delivery parameters relate only to those teachers who are charged with instructing classes in the program curriculum during available instruction time. They do not describe personnel, like the principal, librarian and other support staff, when their responsibilities relate to several programs at a time.

There are three basic patterns of staff assignment: (1) A teacher may be assigned to teach the entire student program to a class. In this case the teacher will be with the class throughout the instructional day. (2) Different teachers may present different elements of the program, rotating among classes of students. (3) Students, either in classes or as individuals who form new classes each period of the day, may rotate among teachers.

If variations in teaching skill repertoires of staff are disregarded, the choice of organizational pattern is independent of the program presented. Even when special skills in a subject area are desired, either of the rotational patterns can be used without changing the program content. Just as changes in staff assignment can be made without changing the program, so can the program be changed without altering the staff assignment patterns. All that is required is that class size remain the same and that existing staff or replacements be considered capable of teaching the new program. Because every program

must fit into the available instructional time, program changes will not usually alter the amount of staff time needed.

However, if the teachers are to be given planning time, or any time not in charge of a full class, during available instruction time, this delivery parameter choice will affect the organizational pattern and the number of teachers needed. The assigning of planning time to teachers depends on having more teachers delivering program than there are classes and will result in some rotation, either of teachers or students, so that classes will be 'covered' when a teacher is out of contact with the class. The assignment of planning time does, therefore, affect costs. Cost implications of teacher assignment will be discussed in Chapters Four, Five and Six.

Instructional materials either carry the program content to the student (textbooks or films) or are used in the process of teaching it (scribblers, pencils, construction paper and other materials which the student uses to write down the program message). Those which carry a message must be compatible with the curriculum and are often dictated by it. Nevertheless, there is a difference between the curriculum and the textbook or materials which present it, which may be likened to the difference between a manuscript and the copies of a book produced from it.

Parameters associated with instructional materials describe the kind of material and its distribution patterns. Is a textbook to be used? If so, is the same one to be used by all students in the class or will some students use one and others another? Will each child be given his own book; will only part of the class use the books at one time; or will the teacher have one book from which lectures, discussions and dittoed seatwork are prepared? Will workbooks be used? How short will pencils be when they are to be thrown away? Answers to questions

like these will determine the supplies needed and therefore the cost of instructional material. Many of the parameters also have consequences for learning and pedagogical methods, but their influence on costs is probably more direct. The cost of materials will be discussed in Chapter Seven.

Support and Milieu Parameters

A program has been defined as the content to be learned by a group of students and the activities designed to teach it. Program parameters list the characteristics of these contents and activities, while delivery parameters delineate the grouping of students, the teacher assignments, and the material used to deliver this package to the students. Both types of parameter relate to characteristics of a specific program.

However, many facets of school activities and organization are not related to any specific program, but provide services or facilities used by many programs. These are described by the support and milieu parameters. CAM designates five categories of support and milieu parameters:

1. Transportation and school location parameters.
2. Parameters describing buildings and their operation and maintenance.
3. Individual student support parameters.
4. Resource service parameters.
5. General support service parameters.

The first of these categories has to do with the gathering of students into groups which can be taught economically. The second gives the properties of the physical accommodations for these students and their teachers. The third and fourth categories describe services rendered to students -- those services which help individual students who otherwise would have difficulty fitting into a group and receiving the program, and those which give access to resource material beyond that provided by the curriculum. The last category refers to administrative and other services which organize and coordinate several programs.

Transportation and school location. As indicated earlier, the need to gather students into groups in a place where they can meet with teachers in order to receive instruction establishes an initial cost of education. Some of the factors which affect these costs are given by the geography of the community: the density and location of the student population in the area, the distribution of students by age and other characteristics relevant to school placement; the size of the area, the ease of transporting students, and the program alternatives which are demanded. However, the effect of these geographic conditions on costs will depend on where schools and school boundaries are located, on what programs are to be offered at which schools, and on the rules indicating how far from a school students must live in order to be eligible for bussing. These parameters will affect bussing costs and school and program enrolments.

Such considerations represent major policy decisions affecting all programs offered. For example, offering an alternative program may decrease enrolment in the 'regular' program, and therefore may affect the per student costs across the board. These costs are those of offering students a choice, of providing alternatives, and should not be charged only to the second program (Chapter Eight).

Buildings and plant operation. These parameters describe the space and amenities provided in the school buildings and the standards of heating, lighting and upkeep used in operating and maintaining buildings. They describe the space within which the teaching/learning occurs, and they generally are cost-related.

Nevertheless, the cost analysis model presented here will not discuss these parameters. In the first place, probably no area of education cost is so thoroughly understood as those of building construction and upkeep. The cost implications of various methods of construction, insulation, and maintenance procedures for schools are similar

to those of commercial and industrial buildings and have been studied by architects, engineers and maintenance experts with an eye to both short- and long-term savings. In the second place, although some vocational or other programs have special space requirements, the facilities offered in most school buildings are equally adequate (or inadequate) for most programs. If special facilities are constructed in a school, they become sunk costs, paid for in the capital cost of the building, available whether or not the program which originally called for them continues.

The availability of facilities will interact with program location parameters and affect cost that way. If the facilities are available at a school, the programs at that location may be adapted to take advantage of them. A case in point would be the emphasizing of dramatic arts in the program offerings at a school with especially fine stage and auditorium facilities. On the other hand, program offerings may be curtailed where facilities are not available. In practice then, schools, especially secondary schools, tend to specialize. The facilities built into schools will influence decisions on where to locate special programs, and these location decisions may affect bussing and other costs.

Individual student support. In most things the schools deal with groups of children who have needs and abilities which are similar enough to accept common instruction (MacNab, 1975:9). In some instances, however, a student has a problem and requires individual attention to fit into or remain with a group or to overcome some handicap. Schools may provide help for these students either by referring them to social services in the community (if available) or by providing personnel to assist the child in the school. Remedial teachers, speech therapists, psychologists, and school nurses are examples of personnel that may be

employed by the school to assist these students. Individual student support parameters describe the types and levels of such services which are provided in the schools. These services are independent of the particular programs offered which are designed for groups of students.

The level of individual support services provided will tend to follow community definitions of what constitutes a problem for a child in school and of how to deal with such problems. The trend has been to increase such services, although in Ontario school health services have been turned over to regional health units. The cost of providing such services is mainly that of salaries of the personnel employed.

Resource services. Although curricula generally indicate specific materials to be used in instruction, there is often a need for access to other materials which enrich the program or allow students to practice skills learned. Such facilities as libraries and audio-visual resource centres are used by students and teachers to gain access to materials beyond those specified in the curriculum. Included in this category might also be consultant services and teacher resource materials for subject areas common to many programs. For example, the increased emphasis on French in 1973 led one of the boards in this study to establish a French resource centre designed to provide language arts materials to the French element in all programs at all grade levels. The resource service parameters describe the kinds of resource facilities, their size (e.g., number of volumes or films), hours of operation, location (at every school or central), and staffing.

One problem for costing presented by the resource services is that different programs may make more and less use of them. For example, one school in this study developed a program in which research projects were a major pedagogical tool in teaching environmental and social

studies. Students in this program used the library much more than students in other programs. On the one hand, if the library costs are considered simply as milieu costs, divided among all programs, this difference in use is not represented in the costs of the various programs, which may, therefore, be distorted. On the other hand, however, since the library facilities and staff for this school are no greater than in other schools of the same size in its board, the inclusion of all library costs in the milieu can be justified: the research projects program was simply making use of resources normally available to any program. In costing, the final allocation of these costs must be a judgement based on the individual case. However, the fact that this sort of program could be offered within the normal resource service provided should raise questions about the level of services supplied and their utilization by programs throughout the board.

General support services. These parameters describe the school administration services, mainly the personnel who coordinate programs, transportation, plant, supplies, staff and students. They will delineate the number and kind of these services, the extent to which these are centralized, and the number and qualification of personnel. For instance, language ability may be an important qualification for some positions.

The milieu parameters describe aspects of the school system which serve several programs. Their costs are those of gathering students for instruction, of providing the setting in which teaching can occur, and of providing services which aid in the teaching/learning process. Although anything which makes the system more complex, such as offering program alternatives, may increase the use of milieu services, the kind of milieu services needed will not usually change because of specific

programs offered. However, services to two linguistic groups and to second-language programs like immersion may be exceptions in that support services must be provided in both languages. If the population from which school staff normally comes is bilingual, such a requirement may make little difference in cost, but if bilingualism is a special qualification or if duplicate personnel are needed, extra cost will be involved.

INTERACTION AMONG PARAMETERS

A taxonomy of parameters has been presented which delineates three aspects of the school: the content, its delivery to the students, and the setting. Within each of these categories parameters are inter-related: content influences pedagogical methods, student organization affects teacher assignment, and the level of individual student services and access to resources varies the burden on administrative services.

Additionally, there are interrelationships among parameters in different categories: including second-language instruction which may demand specialists and thus force changes in patterns of teacher assignment, teacher assignment to deliver program may be affected by the type of services available in the milieu (the use of library services mentioned above was a case in point). These interaction effects are typical of social organizations where people adjust to meet the demands made on them using the resources available.

A great deal of the remainder of this report will be devoted to looking at the kind of trade-offs that are made in schools to achieve the educational programs that trustees, administrators and teachers feel are desirable for students in their schools. Think, if you will, of a one-room school with one teacher and a class of students, where the teacher, or one of the students, stokes the pot-bellied stove.

Such a situation is close to the minimum which can be called schooling, the zero of zero-based budgeting. The options in such a situation are not many. The delivery and milieu are quite inflexible, and only the program can be changed (in keeping with the single teacher's abilities). The teacher may emphasize arithmetic more, take the class outdoors for environmental studies, or encourage cross-age tutoring instead of doing all the teaching. If one child demands more attention there is less time for others. However, if another room, and teacher and class are added, the options increase. There are opportunities for more grouping of students, teacher specialization, and individual help. In a school system with many teachers, resource people and administrators there are many possibilities for using personnel and facilities innovatively to achieve certain goals. With more people and facilities available more substitutions are possible.

Although aiding in the educational process, these complexities make it more difficult to trace the resources allocated or used in the achievement of various program goals. CAM attempts to build from the idea of a single class/teacher learning situation, using 'parameters' to describe features of that situation and its elaborations. The parameter choices may influence the cost of schooling or the learning that occurs or both. They provide handles for thinking about a very complex social system.

PART II: IN SCHOOL PROGRAM COSTS

Chapter Three: Classes and Class Size

Learning is something that happens to individuals, but teaching is usually done to groups. The organization of pupils into classes fills the gap between the individual learning of children and the school's need to deal with many more children than there are adults. Children are sorted by age, ability, and/or other characteristics into groups which need or are expected to learn similar program messages. One or more teachers are then assigned to teach this group the curricula its members need. No child is left out. Each child knows that a teacher--'his teacher' or 'his French (or math or whatever) teacher'--is responsible for presenting program material to him and for helping him to learn it. The teacher also knows for which pupils he has responsibility. Because of its value in assigning responsibility to specific teachers for seeing that children receive the program, the class is basic to school organization.

The class is also important to school costs because it is a cost-incurring unit. It takes up a classroom (or the equivalent space in an open area) and the services of a teacher as a group, irrespective of the number of individuals who comprise it. Instructional aids used by teachers are purchased for a class and even some student materials are purchased in 'class sets' based on the number of students planned to be in a class rather than the actual number. For these reasons the concept of 'class' is important to the costing model.

CLASS DEFINED

A class is defined as any bunch of students who take a program, or program element, as a group under the supervision of a teacher. The emphasis in this definition is on the relationship between a teacher and group of students. Since there is a rule that every elementary student in the school must be the responsibility of a certified teacher throughout the school day, we can reasonably assume that the responsibility for specific students is clearly assigned to specific teaching personnel. This teacher responsibility for students is the defining characteristic of 'class' -- the class consists of those students who are the responsibility of a teacher during a specific period of time. In elementary schools this time is usually the full school day; in secondary schools the assignments are usually for a 'period' of an hour or forty-five minutes.

The breakdown of classes which occurs in team teaching is, for purposes of costing, more apparent than real. Team teaching is the assignment of several teachers to a larger-than-normal 'class' of students, with the intention that the 'class' will be split up in different ways at different times, depending on the needs of the students and the subject matter. Thus, instruction will be given to groups which will vary in size and composition over the school day and the course of a year. On examination, however, one sees that the teachers arrange among themselves how subgroups will be formed and who will teach what to which group; students know who is 'in charge' of them at any time; and if one teacher has a smaller group, another member of the team has a larger group. Although more flexible in terms of student group composition and teacher assignment, team teaching still retains the teacher to student group organization. Furthermore, the ratio of pupils to teachers in the team teaching 'classroom' will usually be approximately

equal to the ratio where a single teacher is isolated by four walls with a class of pupils. In the schools in this study where there is team teaching, the principal reports 'class sizes' which are obtained by dividing the total group by the number of teachers on the team.

The meaning of *class* used in this paper, then, contains three elements: 1) a grouping of specified students, 2) who are to receive some program message 3) from a teacher who has been assigned the responsibility for presenting this information to this group. The teacher-class encounter is a basic mechanism in school systems for organizing the delivery of program to students.

CLASSES AND COSTS

Because there is a paid teacher and a classroom to be provided, the costs of schooling cannot be zero. At minimum a single teacher will be assigned to teach the entire program to a class throughout the entire school day. The cost of delivering the program to a class taught by a single teacher is, simply, the cost of the teacher's salary, plus the cost of books and materials, classroom space, and the class's share of the costs of the milieu.

To illustrate, let us consider the hypothetical case of a school that has ten classes. If each of the ten class teachers receives a salary of \$10,000 and the operation and maintenance of the school costs \$50,000 per year, the cost of a class is:

class teacher's salary	\$10,000
classroom cost*, 1/10th of \$50,000	<u>5,000</u>
total class cost	\$15,000

* 'Classroom' cost figured in this way includes use of common school space outside the actual classroom, such as washrooms and corridors.

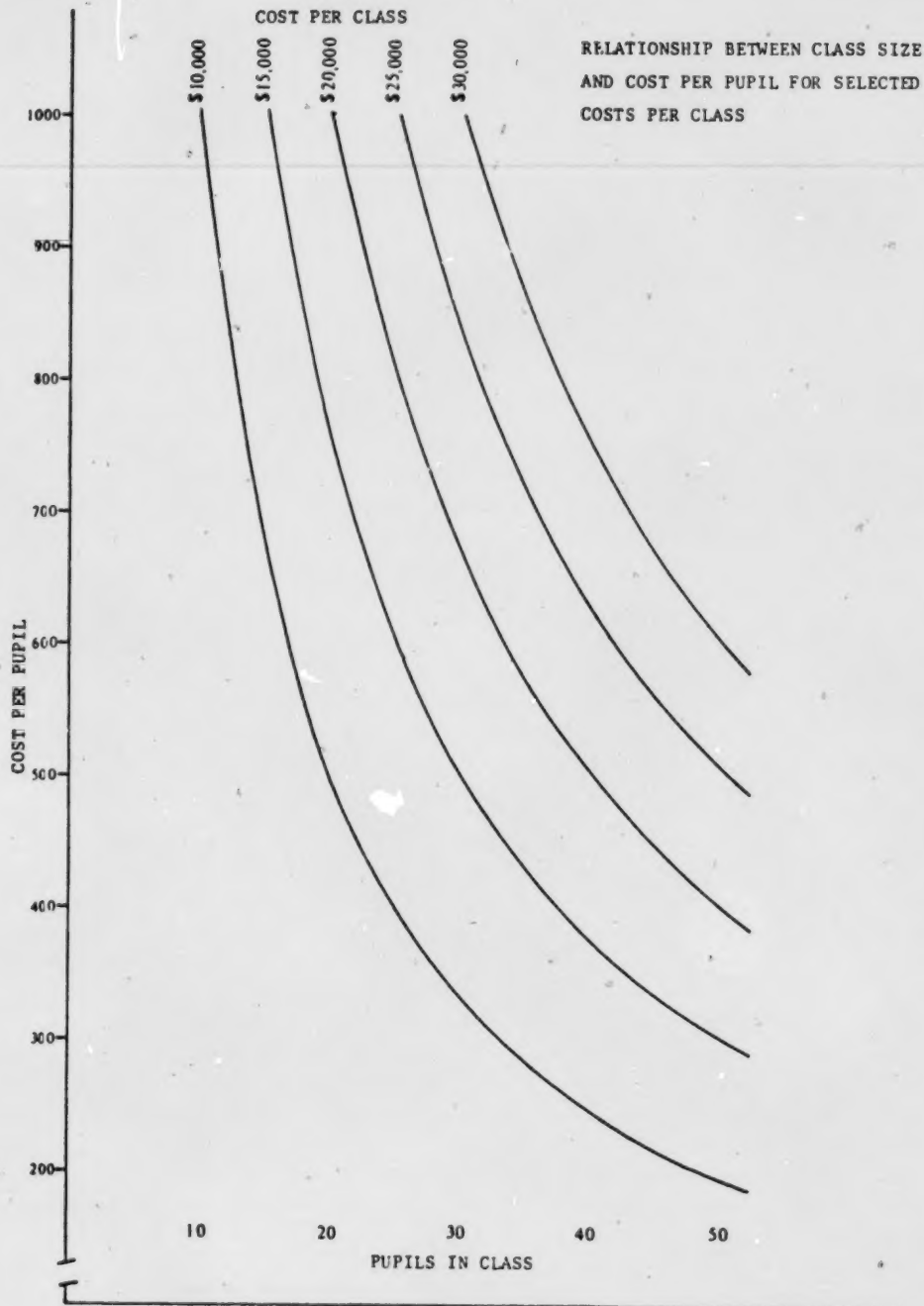
It does not matter what curricula make up this minimal program delivery. So long as the one teacher can present all program elements to the class, the cost will remain the same. If the class teacher instructs French as part of the program it will mean only that less of something else will be given (because of time limitations), but it will not change the cost of delivering the program. Although few schools today choose to be so Spartan, this pattern of one teacher/one class can be used as a baseline, of which other more complex patterns are elaborations.

Neither does the number of pupils in the class matter to the cost of instructing the class. So long as a teacher is assigned to the class throughout the day and the classroom space is not changed, the cost for the teacher and classroom for a class of 10 students will be the same as for a class of 30 (although the supplies would cost less).

Where class size does matter is in per pupil costs and, therefore, total costs. Per pupil costs are generated by dividing total class costs by the number of pupils in the class. Per pupil costs greatly depend on class size, as may be seen by looking at Figure II. When the class cost is \$15,000, the pupil cost is \$600 if there are 25 students in the class, or \$500 if class size is 30. The addition or deletion of one child in a class of 25 will result in a change of $1/25$ or 4 per cent in per pupil costs, as long as the costs of teachers and classroom remain constant. The magnitude of the change in per pupil costs caused by a difference of one child will vary with the original size of the class, being greater for smaller classes and smaller for larger classes.*

* The relationship is hyperbolic. Although this paper talks of class size (since programs are delivered to classes), the relation between pupil-teacher ratio (which includes teachers not assigned to classes), average teacher salaries (instead of per class costs) and teacher costs per pupil are described by the same curves shown in Figure II.

FIGURE II



MAINTAINING CLASS SIZE

In spite of its importance, class size is very difficult to control with precision because the size of actual classes must differ from the prescribed size whenever school enrolment is not an exact multiple of the specified class size. (It may vary for other reasons as well.)

The two boards examined in this study, like most boards, attempt to control per pupil costs through manipulation of class size. In one board, school principals were asked to maintain an average class size of 29 to 30 in 1973 and, in accordance with their contract with teachers, 28 in 1976. In the other, the class size was a 'fall out' from the pupil-teacher ratio. This board set a PTR which is used in the allocation of teachers to the school. The types of teachers and their assignment to each program or to the milieu was decided at the school.* Actual class sizes within a school varied in both boards to meet special student needs or situations and were smaller in lower grades than in higher. The *average* class sizes of most schools (a major exception being small schools, which will be discussed below) in each board were very similar, however. In 1973 the average class size at both boards was very similar at 29.0 in grade 1 to 6 regular classes. In 1976, however, this figure had declined in both boards to 28.2 in Carleton and to 26.4 in Ottawa. Although some of the decline -- to 28 students per class --

* Despite its usefulness to a central administrator in setting limits to teacher costs while allowing the principal flexibility, the pupil-teacher ratio has disadvantages for costing. Chief among these is that the PTR includes all certified staff in a school (which is why it allows the principal discretion in staff allocation), and, therefore, cannot be used to disentangle the cost of one program from another or program costs from general school costs.

may be explained by a change in board guidelines in keeping with contractual obligations to teachers, an examination of the average class sizes at various schools illustrates a major problem of maintaining class sizes. The mean of average class sizes in schools of various sizes at the two boards is shown in Table 1. As can be seen, there has been a decrease in school size at both boards, but this is most pronounced in Ottawa where more than half the schools (29) have enrolments of less than 160. These smaller schools are those where class size is smallest.

In 1973-74, we noted that there was a tendency in the school system for the class size set by board guidelines to become the *maximum* average class size in schools. Principals do not usually assign equal numbers to all classes in a school. They assign fewer in grades 1 and 2 and compensate with larger classes in grades 5 and 6.* Frequently, also, there are one or two smaller classes in a school which appear to be classes of children who need special attention for some reason. Thus, the principal attempts only to make the *average* class size meet guidelines. However, in dividing his total expected enrolment by the class size guide he will usually come out with an extra fraction of a class. It appears as though staffing often allows a teacher for this fractional class, thus keeping class size below the guideline. There is a tendency to allow one teacher extra *per school* to keep classes from going over the guidelines. In this way, the guideline tends to become a *maximum*, rather than an average.** That this tendency is associated with school

* Whether this tendency is deliberate or comes about because declining enrolments mean fewer children coming into the lower grades than are available for grades 5 and 6 cannot now be determined.

** This mechanism was suggested by Dr. G. Halpern.

TABLE 1
MEAN CLASS SIZE BY SCHOOL SIZE: GRADES 1-6

CARLETON

School size	75-150	151-250	251-350	351-450	451-550	All schools
1973						
Cl. size	24.7	29.1	29.2	29.1	28.5	28.96
S.D.	-	1.3	1.9	1.1	.3	1.5
N	1	11	12	18	2	44
1976						
Cl. size	25.96	28.3	28.6	29.4	28.7	28.2
S.D.	2.0	2.5	1.6	1.3	.4	2.0
N	5	13	20	3	3	44

OTTAWA

School size	54-100	101-160	161-200	201-300	301-400	401-520	All schools
1973							
Cl. size	26.4	27.28	28.0	29.8	29.8	29.9	28.72
S.D.	4.3	2.3	1.28	1.26	1.34	0.49	2.06
N	3	11	10	17	12	2	55
1976							
Cl. size	22.95	25.73	26.92	27.58	27.55	--	25.98
S.D.	2.3	2.78	1.88	1.53	1.06	--	2.7
N	11	18	8	15	4	--	56

Cl. size is mean of mean class size

N - number of schools

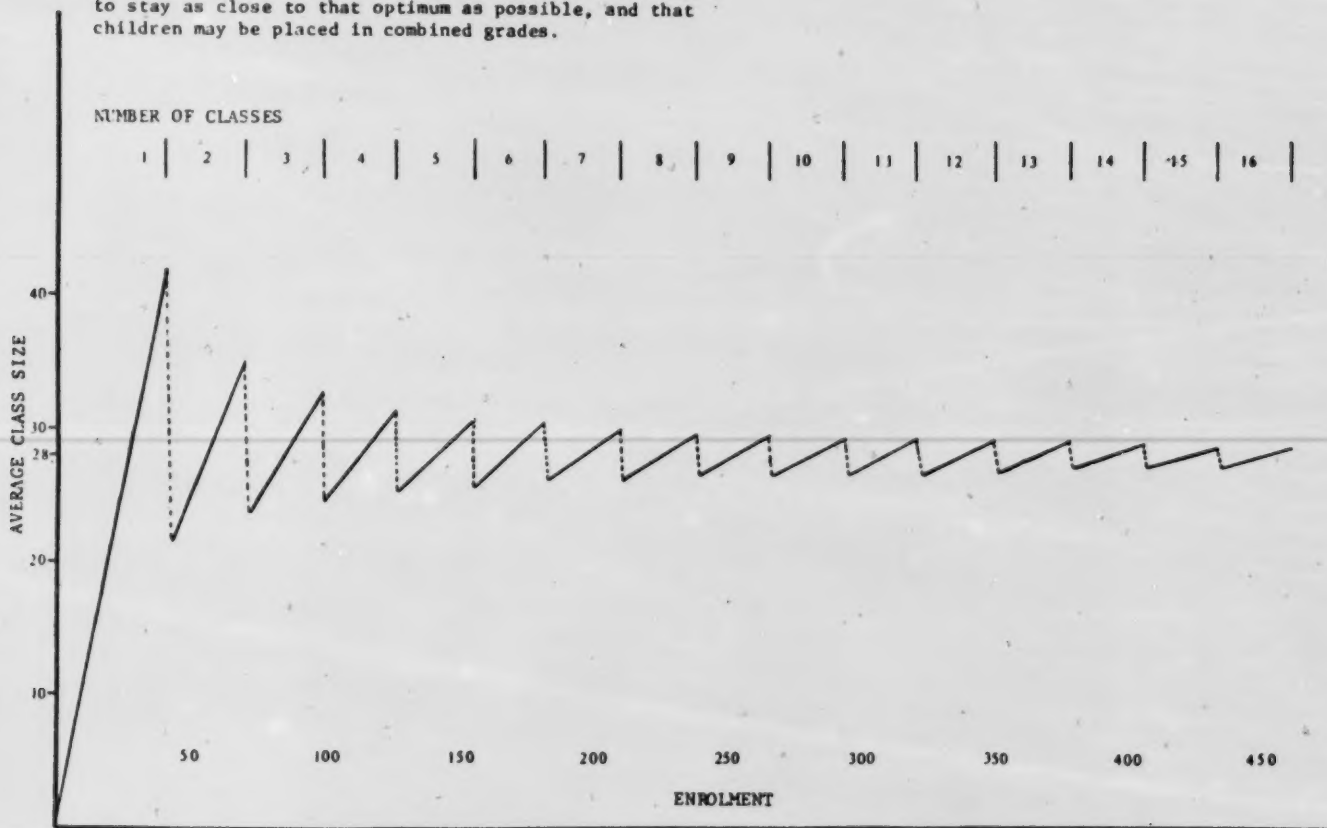
size itself rather than with the decline in enrolment (either actual or in percentages) is indicated by the zero correlation between decline and average class size.

This tendency interacts with small school size to explain the difference between the class size guideline of 28 and the mean of 26.4 found in Ottawa. In small schools class size will tend to fluctuate widely as a small number of classes attempt to accommodate differences in enrolment. When there are many classes in a school, 'extra' pupils can be spread among them with less effect on each one. In smaller schools the impact of 'extra' (or fewer) pupils cannot be spread out, and each class tends to be much smaller or much larger. For example, with an enrolment of 60, the choice is between two classes of 30 or three of 20. Figure III shows what happens to average class size at a school (indicated on the vertical axis), as enrolment (horizontal axis) increases, assuming (1) that the board wants classes of 28, (2) that children may freely be put into combined grade classes, and (3) that as soon as there are 15 pupils (that is, one more than half a class of 28) over the even multiple of 28, a new class is formed. The unwillingness to go as far above the guideline as below it has greatest impact in these small schools.

There is a fairly simple relation between optimum class size and the minimum number of students (and, consequently, of classes) that a school must have in order to be assured of maintaining an optimum average class size. The smaller the optimal class size and the greater the acceptable deviation from the average, the smaller the student population needed in order to be assured that it can always be divided into acceptably sized classes.

FIGURE III

AVERAGE CLASS SIZES IN SCHOOLS OF DIFFERENT ENROLMENTS, if optimum class size is 28, assuming that schools try to stay as close to that optimum as possible, and that children may be placed in combined grades.



The mathematical formula to determine the number of classes necessary to achieve reliable control of class size is:

$$B \geq \frac{Z - 1 - L}{R}$$

where: Z = optimum average class size
L = difference between the optimum average class size and the smallest acceptable average class size
R = difference between the largest and smallest acceptable average class sizes
B = the minimum number of classes and is the lowest integer that will satisfy the equation

Knowing the minimum number of classes necessary to maintain reasonable class size, it is a simple matter to multiply that times the optimum average class size and determine the enrolment level that is needed to operate efficiently with respect to class size.

($E = B \times Z$, where E is enrolment.)

For the class sizes generally found in Ontario and for the fairly small allowable variation in average class size by school, these calculations result in enrolments in the range of 150 to 200 pupils and schools of at least five to seven classes.

TWO KINDS OF ENROLMENT

There is a proviso to these numbers, however. For these enrolments to be adequate at the school level, it *must* be possible to form combined grade classes. There are two different ways of defining the pupils coming into a school. They may be seen as falling into discrete groups as, for example, is the case in traditionally graded schools. Or, the student body may be defined with no natural cleavages which force particular groupings, that is, the school population is continuous, or homogeneous. To be adequate, enrolments must be continuous.

The discontinuities of the discrete group definitions may be formed by grade level where children pass (or occasionally do not pass) from

grade to grade on the basis of completion of a total year's block of work. Discrete groupings may also be formed by grouping children into different programs, such as a French immersion and a regular program. In some schools the discrete groups may be formed by streaming children where boundaries between streams are fairly rigid.

However formed, each discrete grouping acts as a separate enrolment pool, and each has its own necessary size of enrolment needed to provide control over class size within it. For example, if students taking separate programs cannot be put into the same class, these programs define discrete groups of students. Even if the programs are offered in the same building, they are different 'schools' in so far as the formation of classes is concerned. Unless each program enrolment is adequate, class sizes in the building as a whole cannot necessarily be maintained.

Where the student body is defined as continuous there may be criteria, such as age, achievement or I.Q., that are used to sort children into classes; but it is considered that the 'highest' child in one class is not much different than the 'lowest' child in the next, and that, therefore, the break between classes could have fallen at some other point had numbers demanded it.

The continuous student body forms a single unit for purposes of determining the size of enrolment needed to provide control over class size. Thus, defining the student population in this way enables smaller schools to be viable in terms of maintaining class size. However, the smaller school with continuous enrolment will tend to have a wider range of ability or age in each class, which may be a pedagogical drawback.

Of course, each of these ways of defining a student body has definite pedagogical and social implications, as well as an effect on class size control. The discrete population, when organized by strict division into grades, implies a more coherent grade level curriculum;

when organized by program, it implies real differences between the programs. The discrete organization demands a much larger school unit. These larger units may interfere with the 'community' school concept or, conversely, may help integrate larger areas into a community. Unless there is to be bussing, they require a fairly high density of population.

The continuous grouping plan, on the other hand, implies an integration of students and the need to provide for truly individual continuity of progress if the homogeneity is to be maintained.

IMPACT OF FRENCH IMMERSION

The French immersion programs introduced into both boards in 1970 formed two discrete enrolments of students and made an impact on class size through their effect on size of enrolment. This impact was both direct, reflected in the size of immersion classes, and indirect in the effects on regular program enrolments.

In 1973, the size of immersion classes was, indeed, small. In Carleton the average class size was 22.5 (compared to a guideline size of 25), and in Ottawa the average was 25 (guideline of 30). At that time the leading edge of the program was in grade 3. As expected, the increase in enrolment in French immersion has resulted in an increase in class size. In 1976 in Carleton immersion classes average 25.2 pupils and in Ottawa they average 26.7 pupils.

Thus, in Ottawa the average class size in immersion is *greater* than for non-immersion schools. This paradox is explained by the fact that immersion students are concentrated in fewer schools, located where sufficient enrolments may be maintained. Optional programs may be more easily relocated than can changes be made in long-established neighbourhood schools. Immersion was first offered in 15 schools, but these classes were later relocated in eight schools.

The indirect effects of a second program on class sizes in the first are more difficult to assess and depend, in part, on the measures taken to maintain enrolments in the first program. In Ottawa, declining enrolments overall created problems which were exacerbated by enrolment shifts to French immersion. In 1976 29 of the 55 grade 1 to 6 regular program schools had enrolments under 160, the minimum at which class sizes of 28-29 can be maintained. However, if French immersion were eliminated and all its students returned to their neighbourhood schools, only six of the 29 schools would become larger than this minimum, and five of these would still have enrolments of less than 200. In Carleton five schools were under 150 and only three would be over 150 if there were no French immersion. One, which shares a building with French immersion, would have a healthy enrolment of 291; the other two would still have small enrolments (159 and 178)..

There is no correlation between the mean class size in the neighbourhood non-immersion school and the percentage of public school children who live in its sending area who take French immersion. This relationship is shown in Table 2.

We conclude, then, that offering the second program did not force small classes on the first program, but that these were mostly caused by the location of schools in neighbourhoods with small school age populations. Where this situation exists, the alternative program may exacerbate it, but removing the alternative will not solve the original problem.

In this analysis we have not looked at the impact of French immersion at the kindergarten level. Its impact on class size at this level is apt to be somewhat greater than in grades 1 to 6 for at least two reasons. One is that the proportion of a cohort choosing to take immersion in kindergarten may be somewhat greater than the proportion

TABLE 2

MEAN CLASS SIZE OF SCHOOLS BY SCHOOL SIZE AND PERCENTAGE OF PUBLIC SCHOOL CHILDREN IN NEIGHBOURHOOD TAKING FRENCH IMMERSION, GRADES 1-6

OTTAWA 1976

Present school size	Taking French Immersion		
	30% and over	29-10%	under 10%
Less than 160 (No. of schools)	23.3 (5)	25.8 (13)	24.5 (10)
160-250 (No. of schools)	28.2 (5)	26.5 (3)	26.2 (7)
Over 250 (No. of schools)	-- (0)	28.1 (4)	27.9 (8)

CARLETON 1976

School size	Taking French Immersion		
	30% and over	29-10%	under 10%
Less than 150 (No. of schools)	25.2 (2)	29.4 (1)	25.0 (2)
151-250 (No. of schools)	25.7 (3)	29.7 (3)	29.1 (7)
Over 250 (No. of schools)	27.5 (3)	28.6 (15)	28.5 (8)

choosing to take elementary level work in French. The second reason is that kindergarten students tend to be a separate (discrete) enrolment from grade students, and therefore already represent a small group for whom separate teachers and rooms must be provided. Dividing this small group among programs will make more impact on class size.

SUMMARY

This chapter has argued that classes incur certain costs (at least the salary of a teacher and the price of the classroom) as units, and that the parameter of class size is a very important determinant of school costs, whatever its pedagogical implications may turn out to be. The loss of one child from a class of 25 will result in a 4 per cent increase in per pupil costs.

The board of trustees of a school district exerts control by setting guidelines for class size which may specify an optimum class size for all classes, a series of optimum sizes depending on grade level and/or type of program, or an average optimum class size for school units, leaving to the principals the decisions with respect to individual classes within schools. In any case, the guideline operates to produce an optimum average class size for the system, one that is optimum in the sense of producing quality education at reasonable cost.

Whatever guidelines are given there will be deviations from these norms because of fluctuations in enrolments. Enrolment in each school depends on the school sending area. Its population density and composition (and whether the area is stable, growing or declining) will be the major factors determining the numbers and ages of children entering the school. The fact that the system is broken up into these discrete school units has a limiting effect on the board's ability to control class size.

These children will be divided up among classes within the school according to some criteria such as age and/or ability. Seldom will they be able to be divided exactly evenly, but the larger the enrolment the more likely most classes can be very close to the guideline. Furthermore, program restrictions or rigid grade placement may divide the total school enrolment into sub-enrolments, each of which constitutes a separate group within which class size must be maintained. The empiri-

cal data and mathematical theory both indicate that for classes in the 25 to 30 student range to be ensured, enrolments of at least 150 to 200 are necessary. Larger enrolments may allow for class groupings which are more homogeneous in ability or some other criteria. The offering of a second program will affect class sizes (and, thus, costs) when it affects enrolments, bringing them below the level necessary to maintain class size. Its effects are, therefore, most felt when enrolments are declining, or when schools already have small enrolments because of a low population density.

Chapter Four: A Cost Weighting Technique for Subjects

This chapter will begin the examination of costs of presenting the program to the students by providing a technique for understanding the costs of teachers who instruct classes in the program. The following chapters will examine the actual teacher assignments in several schools using these techniques.

The problem for the school is to present its program to the students in a manner which will best facilitate learning of the program information or 'message'. Typically, school systems have a teacher communicate the material to be learned to a group of children. The costs of a school system are, ultimately, the costs of putting the teacher into contact with the students during the time necessary to communicate the 'message' and to allow the students to learn it, and of providing the space, materials, and support staff which will enable the teacher to perform the teaching task. The relation between student time and teacher time intervenes between learning and cost. It is teacher time that costs money (by far the largest single cost of a school), while learning takes student time. The cost of presenting a program to the students will depend on the way students and teachers are deployed in relation to one another.

AVAILABLE INSTRUCTION TIME

'Time costs money' is an axiom of the business man who must pay workers to produce a product. The product of the school is learning and there are two types of people who contribute to this task: students and teachers. The product is, in a sense, created in the heads of the

students by the joint efforts of the students themselves and their teachers. Both contribute man-hours to the product, and both student man-hours and teacher man-hours have important, but different, relationships to cost.

Student time, itself, is 'free', but it plays a large part in determining other costs, especially the costs of teachers. The organizing of students into classes, discussed in the previous chapter, is a way of reducing the amount of teacher time (which is paid for) needed to instruct pupils. Classes change student-hours into *class-hours*. Since teachers are responsible for instructing classes, rather than individual students, it is class-hours that will determine the total amount of instruction time needed.

Teacher time is paid for by the board in the form of salaries, or, when a teacher is absent, in substitute's pay. The school board has control of the number of teachers and, therefore, the teacher-hours in the system. Teacher time may be increased by hiring more teachers. As long as teachers are available, all that is needed to increase teacher time is money to pay the additional teachers. The board may decrease the teacher time in the system by firing teachers or not replacing those who quit.

However, the board cannot increase the amount of teacher time by asking full-time teachers to work overtime. Children are brought into the school for a certain amount of time each day. There is a morning bell to begin classes and a 'class dismissed' bell to end them. In between there are 'time outs' for recess, lunch, changing classes and the like. The time that is left between the 'class begins' bell and the 'class dismissed' bell after the 'time-outs' have been subtracted is the *school day* or the *daily available instruction time*.

Available instruction time is the time allowed for the program message to cross the gap between teacher and student. It is the only time when students are available to receive the program, when they are in range of the teacher's teaching strategies. Since teaching can take place only during the available instruction time, the school day sets a limit on the amount of instruction time that any teacher can contribute to the school. Once all teachers in the system are assigned teaching tasks during this time, additional time can only be obtained by hiring more teachers. Since school staffing is based on the teacher time needed during the available instruction time, the model assumes that the teacher's salary should be allocated to program in proportion to the way his time during the instructional day is allocated.

INSTRUCTION TIME AND OTHER TIME

Of course, the fact that a teacher cannot be assigned more teaching tasks than can fit into the school day does not imply that he *must* teach throughout this time. Although their main duty is to teach classes of students, teachers have many tasks in the school. Some of these, such as yard supervision at recess, must be done outside of instruction time. Because the school day is shorter than the usual adult working day, teachers can be expected to perform other tasks, such as grading papers or preparing lessons, outside the time when students are available for instruction. However, the school administrator may decide that more preparation time is needed than the teacher can reasonably be expected to find outside the school instructional day or he may desire that several teachers meet during instruction time to discuss common problems. He will then arrange that the teachers have time for these activities during the school day by assigning *less* instruction time to them than the school day would allow.

This time, which we will call planning and preparation, or p-and-p, time, is a period (or several periods) during the school day or cycle when the teacher is not responsible for teaching a class, but is expected to be doing something related to the teaching of a class. This may be grading papers, preparing lessons, setting up audio-visuals, or simply taking a 'break'. Whatever the activity, it is time during available instruction time when the teacher is not assigned responsibility for instructing a class and is not assigned to some general school task (as librarian, for instance), but works on behalf of classes while not working with them.

We have delineated, then, three kinds of teacher time. First, there are the hours of teaching, the time the teacher is assigned responsibility for presenting curriculum material to classes of students. This *teacher instruction time* can only occur during the school instructional day. Second, there is *p-and-p time*, time during the school instructional day when the teacher is not responsible for a class of students. Third, there is *non-instructional time*, which is time outside the available instruction time which the teacher may spend on school tasks.

There is yet a fourth kind of teacher time which is relevant to cost. In every school there are some certified personnel who are assigned general school duties not related to specific classes or programs. Included in this category would be the administrative time of principal and vice-principal, the time spent on the library (but not time the librarian spends teaching classes), and the time the remedial teacher spends with individual children. Because these efforts are usually not program specific, the cost analysis model considers them as environmental costs -- the costs of providing a milieu where programs can be offered. Such scheduling of time during the school day

can be called *milieu time*, and has been differentiated into *administrative time* and *pupil/program support time*.

The cost analysis model says that teachers are paid to instruct classes of students. Although teachers do other tasks in the school, these are done as ancillary tasks to the main job of teaching. Since instruction can only take place during the school day, the analysis of teachers' activities during this available instruction time will be sufficient to allocate their salary costs to the programs they teach or to the provision of a milieu. The cost analysis model assumes that a teacher's p-and-p time is used to benefit various programs in about the same proportion as these programs take up his instruction time.

THE TEACHER/CLASS UNIT

In the previous chapter, the idea of a one-teacher-to-one-class unit as a baseline for costing was mentioned. The fact that a teacher must be assigned to a class throughout the instructional day sets a minimum to the cost of presenting a program. That minimum is the salary of the single teacher. Because other patterns of teacher assignment are elaborations of the one-teacher-to-one-class pattern and because this unit is the minimum cost pattern, it may be used as the reference point for costing. The costs of other patterns will be given as ratios to this minimum cost.

Such a reference is useful because changing salary scales and other problems mean that actual costs change from year to year and from board to board. Comparison of programs in terms of the teacher/class unit allows other boards in other years to multiply the relative costs of programs by their own average salary costs to estimate quite accurately the expected class costs of a delivery pattern to their own boards.

PLANNING TIME: ADDED COST

If a teacher is allowed p-and-p time, then another teacher must have responsibility for the class during that part of the school day. P-and-p time for teachers is usually associated with classes in high school or intermediate grades where different teachers are responsible for presenting material from the various subject areas. In this case the school day is divided into periods and students move around from teacher to teacher, taking a different subject each period. P-and-p time is achieved by giving the teacher a 'free' period.

In elementary schools, p-and-p time tends to sneak into the schedule because there is a belief that some part of the program ought to be taught by a specialist. When an itinerant art or music teacher takes over part of the program the class teacher is usually allowed some non-contact time. In schools of the Ottawa and Carleton Boards of Education the introduction of French language teaching meant that the class teacher could leave the class for a short period each day. This 'overlay', as it was called, allowed the class teacher to have p-and-p time.

Table 3^{*} presents the relation between class time and teacher time for a school which has a school day of 300 minutes on a five-day (weekly) cycle. Children in this school receive 30 minutes of French each day and 30 minutes of library instruction each week. The remainder of the librarian's time is charged to the school milieu.

Let us assume for the moment that all the teachers, including French and library, receive salaries of \$10,000. Then the cost of teachers presenting a program to a class in this school is:

* All tables for this chapter are put at the end of the chapter for easy reference from one to another. Table 3 is on page 79.

class teacher:	full-time x \$10,000	\$10,000
French teacher:	0.10 x \$10,000	1,000
librarian:	0.02 x \$10,000	<u>200</u>
total		\$11,200

The addition of the specialists means that each class receives 1,680 minutes of teacher time during the school cycle -- that is, 1,500 minutes of teacher instruction time plus the class teacher's 180 minutes of p-and-p time. The ratio of class time to teacher time is 1:1.12, and this is the ratio of teacher cost in the one teacher/one class unit to the teacher cost in this class since all teachers receive the same salary. The teacher instruction time is the same as the class time. The additional 0.12 teacher time represents the 180 minutes of p-and-p time (12 per cent of 1,500) given the class teacher.

Such a staffing plan leaves the French teacher with no p-and-p time. (For simplicity, we assume that the librarian is able to plan during the time he is providing general library service.) The next four tables indicate alternate ways of allowing p-and-p time for the French teacher.

Table 4 presents a plan of cutting the amount of French instruction time to 20 minutes. This would allow the French teacher a large amount of p-and-p time. Note, however, that it does not change the cost of the program delivery. All it does, in fact, is to transfer p-and-p time from the class teacher -- who loses 10 minutes daily of the p-and-p time (50 minutes in the cycle) -- to the French teacher. The teacher of French is still teaching 10 classes and her p-and-p time would be evenly divided and charged against the programs of these classes. Each class would still be receiving 0.10 of her time, although now one-third of this time will be p-and-p time.

Another way of getting p-and-p time for the teacher of French, while still retaining the 30-minute French period, is to hire another French teacher. Table 5 shows how the staffing of the school might look if a second French teacher were hired for a quarter of the school day. He would have time to teach two classes and have some p-and-p time remaining. The time of the original teacher of French is now divided among eight classes. Each of these classes is charged with 0.125 of his time, of which 0.10 is instruction time and 0.025 is apportioned p-and-p time. As it happens each of the two classes the second teacher instructs will also be charged for 0.125 of a full time teacher -- that is, 50 per cent of his quarter time. The cost per class under plan C is:

class teacher:	1 x \$10,000	\$10,000
French teacher:	0.125 x \$10,000	1,250
librarian:	0.02 x \$10,000	<u>200</u>
total		\$11,450

Note that the ratio of class time to teacher time has also changed and is now 1:145. The increase of 0.025 over plan A results from the added time for p-and-p by the teacher of French.

In Table 6 p-and-p time for the teacher of French is achieved by having some classes not receive any French instruction.* In this case the costs associated with classes 1 and 1/2 will be different from those of the other classes. The costs for classes 2 to 6 will be the same as in plan C:

Classes 2 to 6		
class teacher:	1 x \$10,000	\$10,000
French teacher:	0.125 x \$10,000	1,250
librarian:	0.02 x \$10,000	<u>200</u>
total		\$11,450

* Plans D and E are similar to the situation in primary immersion schools where the class teacher instructs in French and an English-to-immersion teacher instructs classes from grade 2 and above. In the immersion schools we examined, the grade 2 and above class teachers would give part of the program to the kindergarten and grade 1 students so the teachers of these classes could also have p-and-p time (see plan E, Table 7).

For classes 1 and 1/2, however, the cost will be less:

Classes 1 and 1/2		
class teacher:	1 x \$10,000	\$10,000
librarian:	0.02 x \$10,000	<u>200</u>
total		\$10,200

For these classes only the contribution of the librarian gives the class teacher p-and-p time and the ratio of class time to teacher time is 1:1.02.

In plan E (Table 7) French is still not taught to two classes, but teachers with more p-and-p time give up some of this time to the teachers of classes with no French, thus equalizing somewhat the amount of p-and-p time among teachers. Table 7 shows four class teachers who each give up two of the five periods when their class has French to provide instruction for class 1 or 1/2 and p-and-p time for the teacher of that class. This 60 minutes represents 4.35 per cent of the teacher's total instruction time (and we assume that he also, over the year, spends the same per cent of his p-and-p time to benefit this second class). It is deducted from the time (and salary) spent for his own class and is added to the time for the other class. The costs for these two groups of classes are:

Classes 1 and 1/2		
regular class teacher:	1 x \$10,000	\$10,000
relief class teacher:	0.0435 x \$10,000	435
librarian:	0.02 x \$10,000	<u>200</u>
total		\$10,635
class time: teacher time ratio	1:1.0635	

Classes 2 to 3/4		
class teacher:	0.9565 x \$10,000	\$ 9,565
French teacher:	0.125 x \$10,000	1,250
librarian:	0.02 x \$10,000	<u>200</u>
total		\$11,015
class time: teacher time ratio	1:1.1015	

The cost of the remaining four classes has not changed:

Classes 4 to 6		
class teacher:	1 x \$10,000	\$10,000
French teacher:	0.125 x \$10,000	1,250
librarian:	0.02 x \$10,000	<u>200</u>
total		\$11,450
class time: teacher time ratio 1:1.145		

The reader should note that only plan C results in a change in total school costs. In that staffing plan extra staff is added to the school, so there is additional cost. In all the other modes of staffing, the total staffing of the school remains the same so the total salary cost of the school remains the same. What does change is the cost of programs within the school, and the way staff resources are allocated among different programs.

Teacher Utilization and School Size

In this example we have used a hypothetical school with ten classes for ease in calculation. What should now be apparent, however, is that the number of classes in a school will be an important factor in the utilization of any teacher, such as the teacher of French, who gives a part of the day's program to various classes in the school. The number of classes multiplied by the time allocated for French (or any subject taught by a specialist) will give the minimum amount of instruction time which must be contributed by a specialist. If this instruction time equals the school day (as in Table 3), the specialist has no p-and-p time, unlike other teachers in the school. If (as in Table 4) this time is much less than the school day, the specialist has an inordinate amount of p-and-p time relative to other teachers. If the necessary special subject instruction time is greater than the school day, a second specialist will have to be hired.

In the elementary schools of the Carleton and Ottawa Boards of Education which we have examined, the number of classes in a school fluctuates greatly from a minimum of three to a maximum of 22. The amount of

instruction time reported by teachers of French also varied widely. In these boards it is unusual for the teacher of French to teach in no more than two schools (and, therefore, the quarter-time teacher in Table 5 may be unrealistic). Because the school day is usually somewhat shorter than the 300 minutes we have used in these examples, a school of 11 or 12 classes affords the best teacher utilization for a French program of 20 minutes per day. This allows the teacher of French time to change classes as well as some p-and-p time. One of the Boards aims at a maximum load of 220 minutes per day for basic French teachers working in the 20-minute program because of the strains involved in the itinerant teaching situation. The administrator planning on programs which require specialist teachers should be aware of the problem caused by variations in school size for the utilization of the specialist teacher, since it probably means extra costs.

SALARIES AND COSTS

In the previous section we saw that program delivery costs increased whenever p-and-p time was added to the teacher instruction time. In those examples the salaries of all teachers were the same and so cost increased in proportion to added p-and-p time. This is not always the case, however. If the average salaries of different kinds of teachers differ, then increasing the time of a more expensive kind of teacher time will increase costs by more than the teacher time (whether instruction or p-and-p time) involved.

For example, if the French teacher's salary were larger than that of the class teacher (for the sake of illustration only -- this was not the case in the Carleton or Ottawa Boards), then the cost of the French portion of the program would change faster than the time devoted to it. To illustrate, let us set the salary of the French teacher at \$12,000,

or 1.2 times the base salary of \$10,000. The revised cost of a class in a hypothetical school, plan A (Table 3), would be:

class teacher:	1 x \$10,000	\$10,000
French teacher:	0.1 x \$12,000	1,200
librarian:	0.02 x \$10,000	200
total		\$11,400

The ratio of class time to teacher time is still 1:1.12, but the ratio of cost from the one teacher/one class situation has changed to 1:1.14. The extra 0.02 in the cost is accounted for by the difference between the French teacher's salary and the base salary (0.2) multiplied by the proportion of time he contributes to the program delivery (0.1).

Under plan C (Table 5) the French teacher devotes 0.1 of his time to instruction of each class and in addition has 0.025 of his time available for p-and-p for each class. The cost of a class revised according to the new salary will be:

class teacher:	1 x \$10,000	\$10,000
French teacher:	0.125 x \$12,000	1,500
librarian:	0.02 x \$10,000	200
total		\$11,700

The addition of French teacher's p-and-p time has increased the ratio of class time to teacher time to 1:1.145, while the cost, relative to the one teacher/one class situation, has increased to 1:1.17. The cost of the class relative to the one teacher/one class base unit is equal to

$$\sum_{t=1}^n M_t (I_t + P_t)$$

where $t_1, t_2, \dots, t_n$ are all the teachers involved in presenting a program; M_t is the ratio of the salary of t_n to the base salary; I_t is the proportion of the school day that t_n is assigned instruction of the class; and P_t is t_n 's p-and-p time charged to that class program as a proportion of the school day. The actual cost of the program can be obtained by multiplying this sum by the base salary. For the French teacher under the revised plan C, $M_f(I_f + P_f) = 1.2 (0.1 + 0.025) = 0.15$,

and 0.15 times the base salary of \$10,000 is \$1,500 which is the cost of the French teacher shown above.

PROGRAM ELEMENTS

Up to this point we have assumed that the class is a unit that stays together throughout the school cycle. We have obtained total program costs by adding up the cost of teacher time.

There are two reasons for complicating this simple model. One is that classes do not always remain intact over the cycle. They may split up, combine, or recombine for some program elements in ways that affect costs. Although such class changes are more usual in schools 'on rotary' they may also occur in elementary schools as when each grade of a combined grade class takes basic French separately or when parts of several classes take extended French together.

The second reason for moving away from the simple model is that educators want to know the contribution of various program elements to the total cost of offering a program. By introducing the concept of program element, the model allows this issue to be examined. However, the reader must note that these subject costs *cannot* be considered in isolation. They are the contribution of a program element to total program costs within the double context of the specific program and the specific staff organization of the school within which the program is given. Furthermore, the costs presented here are not the costs of the information -- the program content of geography, math or French -- presented to the student, but rather the costs related to the staff and student organizations which provide the setting in time and space within which many contents might be offered.

In the simplified model that we have presented so far, we have related the time of the teacher directly to the time of the class. In the example we listed a teacher of French, a librarian, and a class teacher, or the teacher of everything else. There was a tacit assumption that the teacher of French was responsible for the presentation of a program element whose content was French language skills and that the librarian presented information about libraries and their use.

The introduction of the concept of program elements allows us to back away from the identification between teacher and content and to speak of the teacher's contribution to instruction of various program elements. It also allows us to speak of classes (or parts of classes) receiving instruction in diverse program elements.

Program elements are subjects or groups of subjects which are differentiated from one another because the cost of offering them is the issue of concern or because they are taught to part or combined classes or by different teachers who may have different salary scales or different instruction time to p-and-p time ratios. Differentiation of program elements for costing purposes is, to some extent, a matter of convenience. However, program elements must always be differentiated when there are differences in class or staff organization delivering some part or parts of the program.

Program elements may also be common to two or more programs. Differentiation of similar elements across programs is necessary when subject time allocation and provision of p-and-p time are the result of choices about program delivery and is not necessary when they result directly from numbers of classes and staff scheduling as organizational problems. In the final analysis, the designation of program elements must make sense in terms of determining the costs of program parameters.

AN EXAMPLE OF PROGRAM COSTING

Tables 8 and 9 show the class/program element matrix and the teacher/program element matrix for an illustrative intermediate school. These tables were developed from class and teacher schedules used by an actual school. The school day is divided into 17 20-minute modules and the school cycle of seven days has 119 modules. The eight grade 6 classes and 16 grade 7/8 classes are organized into 'houses' of four classes each. A group of three teachers present the 'house' or 'core' program elements to each house. These subjects are English, mathematics and environmental studies to grade 6, and English, mathematics, history and geography to grade 7/8.* In the original class and teacher schedules these subjects were listed separately and it would be easy to keep them separate for costing. They are combined here in order to simplify this presentation.

These matrices serve two functions: 1) They display the program assignments of classes and of teachers, and 2) they enable computations of class time use and teacher time assignment. Table 8 indicates that all grade 6 classes receive approximately the same program in terms of time allocated to program elements. All grade 7/8 classes receive similar doses of each subject included in their program, although this program differs from that of grade 6 classes. The average time allotment (in modules per cycle) for each program element on the two programs (grade 6 and grade 7/8) are indicated, and these average times are converted into proportions of the school cycle. The last line of

* In addition to the 'house' subjects, the school offers French (FR); industrial arts (IA); home economics (HE); art; music; unified arts (UA), which is a program element which includes industrial arts, home economics, art, music and theatre arts; physical education (PE); library (LIB); science (SCI); guidance (GUID); options (OPT) when a variety of informal subject matters are offered to students by every teacher in the school except the principal; and homeroom (HR).

Table 8 shows the total amount of instruction time received by the 24 classes in the school.

Table 9 indicates two things for each teacher (or type of teacher): 1) on the first line, the modules per cycle spent instructing each of the program elements and for p-and-p; and 2) on the second line, the p-and-p time is allocated to each program element in proportion to the amount of instruction time the teacher spends on it. Where several teachers have the same schedule, the instruction and p-and-p time allocation for one such teacher is shown, followed by the number of other teachers with this schedule and the total instruction and total p-and-p time for these other teachers.

The last three lines of this table indicate for each program element (and the milieu) the total amount of 1) teachers' instruction time, 2) p-and-p time, and 3) total teacher time contributed to the delivery of each program element.

These two tables tell us how much instruction time in each program element the *class* receives and how much instruction and p-and-p time the *teacher* gives to each program element. The program element is the link between class time and teacher time. Table 10 shows how the computations linking class time to teacher time are made. On line 1 of Table 10 the *total class instruction time*, T_c , for each program element is entered (i.e., the last line of Table 8 is brought forward). On line 2 the amount of *teacher time devoted to instruction*, T_i , of each program element is entered from Table 9. For house subjects, it will be noted, class-received instruction time and teacher-given instruction time are the same, 1633 modules per cycle. Each class receives this instruction as a group from a 'house' teacher, so the teacher instruction time and class time should be equal. This equality is indicated on line 5 by

the teacher instruction time/class instruction time ratio, I , of 1.0.

Similarly, classes take French as a whole, the teacher instruction time equals class time, and the ratio I (line 5) is, again, 1.0.

For united arts (UA), however, classes do not remain intact. Four classes take united arts at a time, with each student having a choice of one of five arts subjects -- industrial arts, home economics, art, music, or theatre arts. The four classes re-form into five class groupings and are taught by five teachers for this element of their program. Thus, the ratio I is 1.25. This number indicates that one and a quarter teachers are instructing each of the four original classes. Its reciprocal ($4/5$) is the 'program element class size' relative to the normal class. This program element class size may indicate that administrators perceive a particular program element as more difficult to teach or requiring special supervision.

An altered teacher instruction time/class instruction time ratio is also seen for two other program elements at this school. Grade 6 classes split into two groups, each taking either industrial arts or home economics with one teacher handling each subject. This is indicated by the ratio I of 2.0. These half-size classes are justified by the need for a great deal of supervision when students are becoming familiar with the equipment used for these subjects. The options program element also has a rich teacher instruction to class time ratio, required in order to offer a wide range of subjects to meet student interests and to draw all teachers in the school into contact with students.

Line 3 (brought forward from Table 9) shows the amount of *p-and-p* time, T_p , allocated to each program element, and line 6 shows the *ratio of p-and-p time to class instruction time*, P . The ratio P indicates the amount of *p-and-p* time allowed for each unit of class time. The IA/HE

program element allows a large amount of p-and-p time for each module of class time. Note, however, that this amount results largely from the fact that this program is given to half-sized classes, and that teachers of industrial arts/home economics are allowed about the same amount of p-and-p time per *teacher* as house or art teachers. Even among teachers of full classes, however, there is considerable variation in p-and-p time allocation, from the .3445 per class instruction time module for the French program element to the .125 for the science program element.

The total teacher time to class time ratio is shown on line 7. This number may be obtained in two ways, either by adding I (line 5) and P (line 6), or by dividing total teacher time (line 4) by class time (line 1). The T_t/T_c ratio (I + P) is a measure of overall utilization of teachers in relation to class time.

A *salary ratio* (M) for teachers of each program element appears on line 8 of Table 10. This ratio is brought forward from Table 11 on the following page. The salaries that appear on Table 11 are, roughly, the median salaries for each category of teacher at the two boards in 1973.* The 'salary ratio' uses a base salary of \$10,000. The base is arbitrary in that any figure could be used, although a base which results in most ratios being near (either above or below) unity has the advantage of convenience; \$10,000 has the further convenience of ease in computation.

Line 9 shows the product of the salary ratio M (line 8) and the total teacher time to class time ratio (I + P, line 7). This product is the *program element cost weight factor*, W, which indicates the relative

* The median salary for French teachers is probably low for an intermediate school, since it is based on the salaries of all basic French teachers, most of whom were teaching at the elementary level.

cost of teachers for each program element as it is offered in the school. The cost weight factor may be thought of in this way: if the cost weight factor is multiplied by the base (in this case \$10,000) it gives the cost of presenting the one program element full time to a class for one year, given the program element class size, p-and-p time allotment and median salary which are actually used for that element in this school. The cost weight factors can be used to compare the costs of offering a unit of class time of different subjects, if it is kept in mind that these are the costs of teachers as they are assigned at this school and that they are *not* necessarily related to program content, pedagogical methods, or curriculum information.

Thus we see that the cost of offering IA/HE at this school is relatively costly, because of all three of the factors that contribute to teacher cost -- program element class size, p-and-p time in relation to class time, and salary scale. The physical education program is relatively inexpensive -- it is given to regular sized classes, by teachers who have less p-and-p time and somewhat lower salaries than most teachers at the school. The French program element is a bit below the cost of the core or 'house' subjects since French teachers have lower salaries but more p-and-p time.

The program element cost weight factor indicates the relative contribution of each program element if given for the same amount of time. It remains to see how these contribute to program costs. We believe that there are two programs offered in this school, one for grade 6 and one for grade 7/8. There are minor variations among classes within each program, particularly with respect to whether the class has a formal library period scheduled. We have, nevertheless, decided to consider that only two programs are offered and to use average time

allotments for each program element. The average time modules of each program element for both the grade 6 program and the grade 7/8 program are shown in Table 8. These are divided by 119, the total number of modules in the school cycle to obtain the *portion of available instruction time each program element is allotted* and this portion, C, is shown on Table 8 for each program element on the line below the average time. This portion of school time is brought forward to Table 10 on line 10 for each program. Line 11 on Table 10 shows the teacher cost for each program element relative to the one teacher/one class cost. These relative costs are summed in the last column to obtain the total relative cost for the program. Thus, the grade 6 program per class costs are 1.4726 times the one teacher/one class cost with the teacher receiving the base salary of \$10,000. For the grade 7/8 program the figure is somewhat less, 1.4401. The difference comes mostly from the high cost of the IA/HE program element for grade 6 which is not balanced by the UA costs of the grade 7/8 program.

The final set of program figures, on line 12, shows the percentage of the total relative cost (1.4726 or 1.4401) accounted for by each element. This number is of interest in comparison with the figure for C, the portion of school time. If the proportion of cost is greater than the portion of time, the element is more expensive relative to other elements. If it is less, the element is relatively inexpensive.

We must stress again that relative program element costs are those of teachers as they are assigned in this school. Relative costs would be different if teachers were assigned different amounts of p-and-p time or if salaries were different. The program element content is a determinant of teacher costs only to the extent that administrators decide that a particular content requires or allows smaller or larger classes, more or less teacher p-and-p time, or teachers with different salary scales (because of experience, education or specialty). As mentioned,

the most expensive program element at this school was felt to require small class size, and perhaps also a salary scale more competitive with industrial scales.

COST WEIGHT FACTORS AND PROGRAM PLANNING

The costs of a program can be developed without using ratios and cost weight factors by translating teacher time for program elements directly into salary costs. (See The FRENCH Project, Working Paper 87.) However, the use of ratios and the cost weight factors has definite advantages. When we look at the cost of existing programs, they allow comparison of the contribution of various program elements to cost and they locate the source of these costs that result from program element class size, p-and-p time, and/or relative salary scales. Because they are ratios they allow comparative costs of program elements to be considered in the light of what the program element is seen to contribute to the total program mix.

However, the importance of the cost weighting ratios does not lie with auditing existing programs, but with their value in the analysis of costs for program planning. The program cost factors matrix may be used to indicate where trade-offs can be made, and may also indicate cases where changes are not effective ways of changing costs.

We will illustrate this use of cost weighting ratios with the school presented in Tables 8, 9 and 10. Let us assume that the per class cost of the grade 6 program is judged to be too high. The planner will examine all the program elements to see where the greatest cost per unit of class instruction time occurs. The weight factor (W) of 3.114 for the program element IA/HE (Table 10, line 9) and the fact that the proportion of the total cost (line 12) incurred by it is more than twice that of the proportion of class time (line 10) indicate this program

element as a place where costs might be cut. Costs are high for this element because it is presented to half-size classes, by teachers having fairly large amounts of p-and-p time (relative to full class instruction time) and somewhat higher salaries. We will assume that the salary scales cannot be changed, and see how changes made in p-and-p time and teacher/class instruction time ratios affect costs.

Table 12 presents alternative plans for delivering the industrial arts/home economics program elements. For each plan, only the columns for program elements which have been changed from Table 10 are shown. Note, however, that each column headed CA on Table 12 replaces two columns on Table 10, those for IA/HE and art. The information about the unchanged program elements for grade 6 remain as shown on Table 10 except that the portion of total (line 12) would change if the program total under the new plan is different.

The first thing that may occur to the program planner is to lower the amount of p-and-p time for IA/HE teachers (plan A). At present these teachers get about the same amount of p-and-p time per teacher instruction period as other teachers, but since they instruct half-size classes this results in more p-and-p time per pupil or per class instruction period. If they were to receive half as much p-and-p time, the total program cost would be reduced from 1.4726 (x \$10,000) per year to 1.4596 per year, a difference of about \$130. However, it is doubtful if such a reduction of teacher time and salary can be practically achieved, since the time difference is too small to change a full-time teacher to part-time. Only if this teacher time could be usefully assigned to some other program or the milieu would any real saving be achieved.

The second approach to the problem is to consider a combined arts program element similar to the united arts scheme in the grade 7/8 pro-

gram. A combined arts program would increase the class size for IA/HE somewhat by adding another 'art' and having students from two classes take one of three subjects: we show industrial arts, home economics and art. The teacher's salary ratio for 'combined arts' on Table 12 is based on the average of the salaries of these three teachers (from Table 11). In plan B, the planner has assigned the classes to combined arts for the same amount of time taken by both IA/HE and art on Table 10, that is, a total of 12 periods for each class and 96 periods for all eight classes. Giving this program element involves the same amount of teacher time as the old IA/HE and art elements. While class size of IA/HE was increased, this increase was balanced by a decreased class size in art. For this reason it does not change total program costs. Resources are spread more evenly among these subjects, but the total remains unchanged.

Plans C and D still consider offering combined arts to 2/3-sized classes. However, less total time is assigned to combined arts than in the original program (Table 10), and, therefore, the total contribution of the relatively expensive CA program element to program costs is less. This decrease in arts time must be replaced by instruction in some other program element. In plan C the CA program element has eight periods per class per cycle and the extra four periods of class time are assigned to library. Plan C will reduce program costs by almost \$400 per class per year and, in addition, will reduce school milieu costs, since the additional 32 periods for library represents 26 per cent of the librarian's time which would be removed from the milieu and assigned to program.

Plan D assigns grade 6 classes to six periods of combined arts and assigns the remaining six periods to the time for French. This plan reduces the total program costs by \$740 per class per year (but, unlike

plan C, does not affect the milieu). It should be noted that of the plans presented so far plan D is the most feasible in terms of existing school structure. It would involve a reduction of over 20 per cent of the full time of each of three teachers involved in the combined arts and, as shown here, could be achieved without adding French staff by reducing the French teacher's p-and-p time to a level only slightly below that of house teachers (and larger than the science teacher).

Plan E simply has full class size for IA/HE. The cost saving is similar to plan D. It reduces the instruction time of the two IA/HE teachers by about 25 per cent. As is the case for plans C and D, the savings must be achieved by reducing the actual time (and therefore the salaries) these teachers are at the school -- they must be assigned part-time somewhere else.

SUMMARY

In this chapter we have developed a technique for examining the costs of teachers who present a program to students. We have differentiated those teachers who actually instruct classes from other teachers who are support staff providing the amenities of the school environment. The cost of teachers presenting the program is analyzed.

The technique is based on the concept of the school day or available instruction time (T), which is the time students are available to receive the program. The program specifies (among other things) what subjects or program elements (e) are to be taught to the class, and what proportion of the available instruction time is to be spent on each. The proportion of T allocated for a program element e we symbolize by C_e .

Whenever a class is formed to take a particular program it will require the services of one or more teachers to instruct it throughout

the available instruction time. One teacher may be assigned to teach the entire program or the class may be assigned a specialist for each subject of the program. Variations may occur between these extremes. For example, while most subjects are taught by a single 'class' teacher in elementary grades, basic French is taught by a specialist.

Furthermore, for some program elements the class may not receive instruction as a unit. It may be split up and taught by two (or more) teachers, it may join with another class and the two (or more) classes together be taught by a single teacher, or it and other classes may join and split in some other way. Thus, although usually the class receives instruction as a unit from one teacher and so the ratio of teacher instruction time to class instruction time, I_e , is one, this is not always the case -- the ratio I_e can be more or less than one.

In addition to instructing, teachers must prepare for their classes and may wish to meet with other teachers of a class to integrate program elements. When time for planning and preparation is during the school day, this non-contact time or p-and-p time must be added to the instruction time spent for the class program when figuring costs. The ratio of p-and-p time to class instruction time, P_e , is added to I_e to obtain the ratio of total teacher time to class time for the subject e. Note that the ratio P_e is based on class time. It will be different from the proportion of the teacher's school day allowed for planning whenever the teacher is involved in teaching groups larger or smaller than the class unit.

We view p-and-p time as a program parameter, something which is assigned to teachers as a result of program decisions. It may be allocated as a spin-off from other program decisions -- instituting basic French in the Ottawa and Carleton schools resulted in a 20-minute daily planning period being given to most class teachers -- or it may

be a separate policy decision -- in some schools on rotary all teachers associated with a class meet together to integrate the curriculum content and teaching approaches for these students. However, the exact amount of p-and-p time given teachers will depend to some extent on the size of the school, the number of classes to be covered and the total school staff. In this paper we have assumed that the p-and-p time found in schools was allocated as a program parameter. However, the planner should be aware that in putting a program into schools, the amount of p-and-p time allocated as a parameter will be imperfectly implemented in the actual school situations.

The final parameter important to program costs is the salary of teachers assigned to teach the various program elements. A program decision to employ specialists, teachers of different grade levels, or teachers with more or less experience to teach a program element will carry with it different salary costs. The model uses a salary ratio M_e which is the salary (or an average salary) of the teachers of program element e as a proportion of some base salary (which may be the system average).

These four parameters will indicate the cost of offering a program. Each program element e will contribute $C_e [M_e (I_e + P_e)]$ times the base salary to the costs of a program. The total cost of a program equals:

$$\sum_{e=1}^n C_e [M_e (I_e + P_e)]$$

times the base salary. The per pupil cost ratio is obtained by dividing this cost weight factor by class size Z .

The model is useful to planners because the five parameters, C_e , I_e , P_e , M_e and Z , determine most of the cost of delivering programs. The mathematical relationships displayed will enable the planner to see

where trade-offs can be made. For example, if class size is to be decreased, the cost weight factor must be decreased proportionately unless per pupil costs are to rise. On the other hand, an increase in I_e which is balanced by a decrease in P_e will cost nothing.

In the next chapters this technique for costing programs will be used to examine the costs of programs offered in schools in the Ottawa-Carleton region.

TABLE 3

HYPOTHETICAL SCHOOL PLAN A

CLASSES	TEACHERS												CLASS TOTAL
	A	B	C	D	E	F	G	H	I	J	FRENCH	LIB	
1	1320										150	30	1500
1/2		1320									150	30	1500
2			1320								150	30	1500
2/3				1320							150	30	1500
3					1320						150	30	1500
3/4						1320					150	30	1500
4							1320				150	30	1500
4/5								1320			150	30	1500
5									1320		150	30	1500
6										1320	150	30	1500
P-AND-P MILIEU	180 N/A	180 N/A	180 N/A	180 N/A	180 N/A	180 N/A	180 N/A	180 N/A	180 N/A	180 N/A	-- N/A	-- 1200	1800 1200
TEACHER TOTAL	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	18000

TABLE 4

HYPOTHETICAL SCHOOL PLAN B

CLASSES	TEACHERS												CLASS TOTAL
	A	B	C	D	E	F	G	H	I	J	FRENCH	LIB	
1	1370										100	30	1500
1/2		1370									100	30	1500
2			1370								100	30	1500
2/3				1370							100	30	1500
3					1370						100	30	1500
3/4						1370					100	30	1500
4							1370				100	30	1500
4/5								1370			100	30	1500
5									1370		100	30	1500
6										1370	100	30	1500
P-AND-P MILIEU	130 N/A	130 N/A	130 N/A	130 N/A	130 N/A	130 N/A	130 N/A	130 N/A	130 N/A	130 N/A	500 N/A	-- 1200	1800 1200
TEACHER TOTAL	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	18000

TABLE 5

HYPOTHETICAL SCHOOL PLAN C

CLASSES	TEACHERS													CLASS
	A	B	C	D	E	F	G	H	I	J	FR A	FR B	LIB	TOTAL
1	1320										150		30	1500
1/2		1320									150		30	1500
2			1320								150		30	1500
2/3				1320							150		30	1500
3					1320						150		30	1500
3/4						1320					150		30	1500
4							1320				150		30	1500
4/5								1320			150		30	1500
5									1320			150	30	1500
6										1320		150	30	1500
P-AND-P	180	180	180	180	180	180	180	180	180	180	300	75	--	2175
MILIEU	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1200	1200
TEACHER TOTAL	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	375	1500	18375

-81-

TABLE 6

HYPOTHETICAL SCHOOL PLAN D

CLASSES	TEACHERS												CLASS TOTAL
	A	B	C	D	E	F	G	H	I	J	FRENCH	LIB	
1	1470											30	1500
1/2		1470										30	1500
2			1320								150	30	1500
2/3				1320							150	30	1500
3					1320						150	30	1500
3/4						1320					150	30	1500
4							1320				150	30	1500
4/5								1320			150	30	1500
5									1320		150	30	1500
6										1320	150	30	1500
P-AND-P MILIEU	30 N/A	30 N/A	180 N/A	180 N/A	180 N/A	180 N/A	180 N/A	180 N/A	180 N/A	180 N/A	300 N/A	-- 1200	1800 1200
TEACHER TOTAL	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	18000

TABLE 7

HYPOTHETICAL SCHOOL PLAN E

CLASSES	TEACHERS												CLASS TOTAL
	A	B	C	D	E	F	G	H	I	J	FRENCH	LIB	
1	1350		60		60							30	1500
1/2		1350		60		60						30	1500
2			1320								150	30	1500
2/3				1320							150	30	1500
3					1320						150	30	1500
3/4						1320					150	30	1500
4							1320				150	30	1500
4/5								1320			150	30	1500
5									1320		150	30	1500
6										1320	150	30	1500
P-AND-P MILIEU	150 N/A	150 N/A	120 N/A	120 N/A	120 N/A	120 N/A	180 N/A	180 N/A	180 N/A	180 N/A	300 N/A	-- 1200	1800 1200
TEACHER TOTAL	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	18000

TABLE 8: SCHOOL F, 1973 - CLASS TIME ALLOCATION TO PROGRAM ELEMENTS (periods per 7-day cycle)

CLASS	Program Elements											TOTAL TIME	CLASS SIZE
	HOUSE	FR	UA	IA/HE	ART	MUSIC	PE	SCI	LIB	GUID	OPT	HR	
GRADE 6													
AA	67	13		6	6	6	8		0	2	4	7	119 32
BA	67	13		6	6	6	8		0	2	4	7	119 32
CA	68	13		6	6	6	8		0	2	4	6	119 32
DA	67	13		6	6	6	8		2	2	4	5	119 32
AB	68	13		6	6	4	8		2	2	4	6	119 30
BB	67	13		6	6	6	8		0	2	4	7	119 30
CB	69	13		6	6	6	8		0	2	4	5	119 32
DB	67	13		6	6	6	8		0	2	4	7	119 29
Average	67.5	13		6	6	5.75	8		0.5	2	4	6.25	119 31.125
Portion C	.5672	.1092		.0504	.0504	.0483	.0672		.0042	.0168	.0336	.0525	1.00
GRADE 7/8													
AA	69	14	12				8	6	0		4	6	119 33
BA	69	14	12				8	6	0		4	6	119 30
CA	69	14	12				8	6	0		4	6	119 35
DA	67	14	12				8	6	2		4	6	119 33
AB	69	14	12				8	6	0		4	6	119 34
BB	67	14	12				8	6	2		4	6	119 36
CB	67	14	12				8	6	2		4	6	119 24
DB	69	14	12				8	6	0		4	6	119 34
AC	69	14	12				8	6	0		4	6	119 34
BC	69	14	12				8	6	0		4	6	119 28
CC	68	14	12				8	6	1		4	6	119 29
DC	69	14	12				8	6	0		4	6	119 32
AD	67	14	12				8	6	2		4	6	119 28
BD	67	14	12				8	6	2		4	6	119 30
CD	69	14	12				8	6	0		4	6	119 30
DD	69	14	12				8	6	0		4	6	119 30
Average	68.3	14	12				8	6	0.7		4	6	119 31.25
Portion C	.5741	.1176	.1008				.0672	.0504	.0058		.0336	.0504	1.00
TOTAL	1633	328	192	48	48	46	192	96	15	16	96	146	2856 749

TABLE 9

SCHOOL F, 1973: TEACHER TIME ALLOCATION TO PROGRAM ELEMENTS (periods per cycle)

N	TEACHER	TEACHER TIME		PROGRAM ELEMENTS											MILIEU	
		TOTAL	P-P	HOUSE	FR	UA	IA/HE	ART	MUS	PE	SCI	LIB	GUID	OPT		HR
10	7-8 HT	119	18	91										4	6	
	7-8 HT	1190	180	18												
				910										40	60	
5	6 HT	119	19	180												
	6 HT	595	95	90										4	6	
				19												
	7-8 HT	60	2	450										20	30	
				95												
	TH A	119	27	52											6	
				2												
	IA	119	19	40		48								4		
				12		15										
	HE	119	19			48	48							4		
						9.5	9.5									
	MUS	119	21			48								4		
						11			46							
	ART	119	19			48	48		10					4		
						9.5	9.5									

cont....

cont....

TABLE 9 - cont.

N	TEACHER	TEACHER TIME		PROGRAM ELEMENTS											MILIEU	
		TOTAL	P-P	HOUSE	FR	UA	IA/HE	ART	MUS	PE	SCI	LIB	GUID	OPT		HR
	SCI	119	12								96 19			4	7	
	PE A	119	13							96 13				4	6	
	PE B	119	19							96 19				4		
	FR A	119	26		82 26									4	7	
	FR B	119	27		82 27									4	6	
	FR C	119	27		82 27									4	6	
	FR D	119	33		82 33									4		
	SPE	119												4	6	109
	LIB	119										15		4		100
	GUID	119											16	4		99
	VP	119												4		115
	PRIN	119														119
	REM	60														60
INSTRUCTION		2988		1633	328	240	96	48	46	192	96	15	16	132	146	
P-P			576	326	113	54.5	19	9.5	10	32	12	--	--	--	--	
TOTAL		4166		1959	441	294.5	115	57.5	56	224	108	15	16	132	146	602

TABLE 10

SCHOOL F, 1973: PROGRAM COST FACTORS

DESCRIPTION	Program Elements												CWF TOTAL
	HOUSE	FR	UA	IA/HE	ART	MUSIC	PE	SCI	LIB	GUID	OPT	HR	
1. Class time Tc Teacher time	1633	328	192	48	48	46	192	96	15	16	96	146	
2. Instruction Ti	1633	328	240	96	48	46	192	96	15	16	132	146	
3. P-P Tp	326	113	54.5	19	9.5	10	32	12	--	--	--	--	
4. Total Tt	1959	441	294.5	115	57.5	56	224	108	15	16	132	146	
5. Ti/Tc = I	1.0	1.0	1.25	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.375	1.0	
6. Tp/Tc = P	.1996	.3445	.2839	.3958	.1979	.2174	.1667	.125	0	0	0	0	
7. I + P	1.1996	1.3445	1.5339	2.3958	1.1979	1.2174	1.1667	1.125	1.0	1.0	1.375	1.0	
8. Salary Ratio M (a)	1.2	1.0	1.2	1.3	1.1	1.1	1.05	1.2	1.2	1.1	1.127	1.2	
9. Weight Factor W (b)	1.4396	1.3445	1.8406	3.1146	1.3177	1.3391	1.225	1.35	1.2	1.1	1.5496	1.2	
I. GRADE 6													
10. Portion C (c)	.5672	.1092		.0504	.0504	.0483	.0672		.0042	.0168	.0336	.0525	
11. Element CW	.8166	.1469		.1570	.0664	.0647	.0824		.0050	.0185	.0521	.0630	1.4726
12. CW/Total	.554	.100		.107	.045	.044	.056		.003	.012	.035	.043	
II. GRADE 7/8													
10. Portion C	.5741	.1177	.1008				.0672	.0504	.0058		.0336	.0504	
11. Element CW	.8264	.1582	.1856				.0824	.0681	.0069		.0521	.0605	1.4401
12. CW/Total	.574	.110	.129				.057	.047	.005		.036	.042	

(a) from Table 11

(b) $W = M(I + P)$

(c) from Table 8

TABLE 11

SALARY SCALE FOR TEACHERS

TYPE OF TEACHER	MEDIAN SALARY	RATIO TO BASE*
INTERMEDIATE CLASS	12,000	1.2
BASIC FRENCH	10,000	1.0
HOME ECONOMICS	13,000	1.3
INDUSTRIAL ARTS	13,000	1.3
MUSIC	11,000	1.1
ART	11,000	1.1
PHYSICAL EDUCATION	10,500	1.05
LIBRARY	12,000	1.2
GUIDANCE	11,000	1.1
VICE PRINCIPAL	15,000	1.5
UNITED ARTS (AVERAGE)	12,000	1.2
OPTIONS (AVERAGE)	11,727	1.127

* Base equals \$10,000

TABLE 12

SCHOOL F: SOME POSSIBLE ALTERNATE PROGRAM PLANS AND COSTS

PROGRAM ELEMENT		A	B	C		D		E
		IA/HE	CA ^(a)	CA	LIB	CA	FR	IA/HE
1. Class time	Tc	48	96	64	47	48	376	48
Teacher time								
2. Instruction	Ti	96	144	96	47	72	376	48
3. P-P	Tp	9.5	28.5	16	--	12	65	10
4. Total	Tt	105.5	172.5	117	47	84	441	58
5. Ti/Tc = I		2.0	1.5	1.5	1.0	1.5	1.0	1.0
6. Tp/Tc = P		.1979	.2969	.25	0	.25	.1729	.2083
7. I + P		2.1979	1.7969	1.75	1.0	1.75	1.1729	1.2083
8. Salary Ratio M (b)		1.3	1.233	1.233	1.2	1.233	1.0	1.3
9. Weight Factor W		2.8573	2.2156	2.1578	1.2	2.1578	1.1729	1.5708
I. GRADE 6								
10. Portion C		.0504	.1008	.0672	.0378	.0504	.1597	.0504
11. Element CW		.1441	.2234	.1451	.1454	.1088	.1873	.0792
12. CW/Total		.099	.152	.101	.032	.078	.134	.057
REVISED CWF TOTAL		1.4596	1.4726	1.4345		1.3893		1.3948

(a) CA - combined arts with art, home economics, and industrial arts. (b) from Table 9.

Chapter Five: Teacher Utilization in Elementary and Middle Schools

In this chapter we examine the assignment of teachers in seven public schools in 1973-74 and again in 1976-77. Using the cost weighting techniques developed in the last chapter, the contribution of teachers' instruction and p-p time, of teachers' salaries and of program element class size to costs will be discussed. The first part of the chapter consists of 39 tables showing the teacher-class assignment at the seven schools, with a description of the school, its programs, and comments about its use of teacher time. The second part discusses the general implications for program costs of various ways of assigning teachers to classes. Before examining the tables, however, a guide to the tables is offered.

Salaries and Program Costs. The tables, as indicated in the last chapter, give a cost weighting factor for each program offered in a school. This factor is the ratio of the cost of teachers for the program to the average salary of an elementary classroom teacher. To obtain actual salary costs for the program simply multiply the cost weighting factor by the average elementary classroom teacher's salary. The cost of supplies and classroom would have to be added on to obtain total costs.

The CWF is based on the time teachers instruct a program, the planning and preparation time of these teachers and any overlay or time when more than one teacher works with a class. It includes differences in average salary among different kinds of teachers, e.g., an elementary class teacher and an intermediate class teacher, or a librarian and an art teacher. The salary ratios used here were

obtained from 1973 data, when elementary classroom teachers in these boards averaged about \$10,000. Intermediate teachers averaged about \$12,000, a ratio (M) of 1.2 to the elementary teachers' 1. In 1976 the salary of both teachers has gone up, say by 40 per cent, to \$14,000 and \$16,800. However, the ratio remains the same. For this reason using the cost weighting factor provides a way of comparing costs across time. Actual costs for 1976, which would be much higher than 1973, can still be obtained by multiplying the CWF by the higher teachers' salary of 1976.

In the tables, we have assumed that salary *ratios* have not changed, that they have all gone up in the same proportion, and we have used the same salary ratios for both years. Thus, some costs may be distorted in later years. Most importantly, French programs were expanding in 1973 and new teachers were being hired. The salary ratio of 1.0 for French teachers in middle schools, where the classroom teachers' ratio was 1.2, is probably low, since it was based on a young staff in 1973. However, we have continued using the 1973 ratio for comparability..

Other comments. In working out the figures in these tables all ratios were carried to six places and rounding was done only after all computations were made.

At some schools there are learning disability (LD), junior or senior opportunity (JO, SO) or other special education classes. These classes have been included in the tables showing class time and teacher time allocations, but no cost weighting factors have been given. These classes must be included in working out teacher time since they often use time of specialists or a teaching vice principal. This time would be added to the p-and-p time of the specialist, and hence to costs of the costed programs, if the LD class were located elsewhere.

The effect of LD classes on other program costs serves to illustrate the main point of these tables: That variations in costs of teachers are related to the number of classes (or students) in a school, and to rules of fairness about p-and-p time, as well as to the needs of program. The tables show a variety of ways that classes, subjects, and teachers are organized. Sometimes these are based on program demands, sometimes on principals' educational philosophies, and sometimes on the numbers and characteristics of students and teachers in the school. At most schools there have been changes in principal between 1973 and 1976, along with changes in enrolments and organization.

SCHOOL A (Tables 13-18)

The enrolment in School A has declined by almost 100 pupils since 1973, with a reduction in the number of classes from 16 to 12, and in staff from 20 to 16. The program also changed: the music period was longer, the 'quiet reading' period has been eliminated, and extended French was no longer offered. Quiet reading was 15 minutes right after lunch which the students and staff spent reading whatever books interested them. It was designed to encourage reading for pleasure. Library was not a pre-scheduled part of programs in either 1973 or 1976, but rather was used as suggested by curriculum needs. Physical education has been taught by the class teacher, and although the gym was scheduled for this activity, it has been included here under core subjects. The vice principal, part of the staff in 1973, taught the English part of the extended program, and was relieved to assume administrative duties by the extended French specialist.

The costs of programs relative to an 'average teacher's salary' have changed between 1973 and 1976, most notably for the kindergarten program. Most of this change from 1.1393 to 1.3452 resulted from the addition of p-and-p time for the kindergarten teacher. In 1973 there was no p-and-p time, but in 1976 the kindergarten classes received 20 minutes a day of basic French from a specialist. The 1973 grade 1 to 5 program at 1.1532 was marginally more costly than either the primary (1.1226) or junior (1.1423) grades programs in 1976. The difference came primarily from better utilization of the time of French teachers (who, in 1973 had a third of their time free for planning). It should be noted that the amount of staff time devoted to providing pupil resources and administration has dropped with the loss of a half-time vice principal. In relation to total class instruction time, it remained almost constant with a ratio of 0.21 (milieu) to 1 (Table 52).

TABLE 13

SCHOOL A, 1973: CLASS TIME ALLOCATION (min. per 5-day cycle)

PROG	CLASS	Z	KGTN CORE	1-5 CORE	BASIC FR	EXT. FR	MUSIC		QUIET READ	TOTAL TIME
							CORE	EXT		
I	K - a	28	650				25			675
	K - b	28	650				25			675
	Portion C		.9630				.0370			
II	1 - a	27		1150	100		25		75	1350
	1 - b	29		1150	100		25		75	1350
	1-2-a	28		1150	100		25		75	1350
	1-2-b	29		1150	100		25		75	1350
	1-2-c	28		1150	100		25		75	1350
	3 - a	26		1150	100		25		75	1350
	3 - b	27		1150	100		25		75	1350
	3 - c	28		1150	100		25		75	1350
	4 - a	29		1150	100		25		75	1350
	4 - b	28		1150	100		25		75	1350
	4 - c	30		1150	100		25		75	1350
	5 - a	31		1150	100		25		75	1350
	5 - b	30		1150	100		25		75	1350
	Portion C			.8519	.0741		.0185		.0556	
III	5 - e	29		650		575		50	75	1350
	Portion C			.4815		.4259		.0370	.0556	
TOTAL		455	1300	15600	1300	575	375	50	1050	20250

Average Class Size 28.43

TABLE 14

SCHOOL A, 1973: TEACHER TIME ALLOCATION (min. per cycle)

N	TEACH	TOTAL T/S	SAL RATIO	P-P TIME	PROGRAM ELEMENTS						MILIEU		
					KGTN CORE	1-5 CORE	BASIC FR	EXT. FR	MUSIC (CORE)	MUSIC (EXT)	QUIET READ	PCR	ADMIN
	KGTN	1350	1.1	None	1300				50				
1	CLASS 1-5	1350	1.0	100		1150 100			25		75		
12	CLASS 1-5	16200	1.0	1200		13800 1200			300		900		
	VP	1350	1.4	25		650 25					75*		600
	FRA	1350	1.0	375			900 375				75		
	FRB	675	1.0	275			400 275						
	FRC	600	1.0	25				575 25					
	LIB	1350	1.2								75	1275	
	MUSIC	450	1.1	25					375 22	50 3			
	REM A	675	1.2								75	600	
	REM B	540	1.2										540
Cont....													

TABLE 14 - cont.

N	TEACH	TOTAL T/S	SAL RATIO	P-P TIME	PROGRAM ELEMENTS						MILIEU		
					KGTN CORE	1-5 CORE	BASIC FR	EXT. FR	MUSIC (CORE)	MUSIC (EXT)	QUIET READ	PCR	ADMIN
	PRIN	1350	1.75								75		1275
	INST TIME	20925			1300	15600	1300	575	750	50	1350		
	P-P TIME			2025	--	1325	650	25	22	3	--		
	TOTAL TIME	27240			1300	16925	1950	600	772	53	1350	2415	1875

* At VP's salary rate.

-96-

TABLE 15

SCHOOL A, 1973: PROGRAM COST FACTORS

DESCRIPTION		KGTN CORE	1-5 CORE	BASIC FR	EXT FR	MUSIC		QUIET READ	CWF TOTAL
						CORE	EXT		
1. Class Time	Tc	1300	15600	1300	575	375	50	1050	
Teacher Time									
2. Instruction	Ti	1300	15600	1300	575	750	50	1350	
3. P-P Time	Tp	--	1325	650	25	22	3	--	
4. Total Time	Tt	1300	16925	1950	600	772	53	1350	
5. Ti/Tc = I		1.0	1.0	1.0	1.0	2.0	1.0	1.2857	
6. Tp/Tc = P		-	.0849	.5	.0435	.0587	.06	--	
7. I + P		1.0	1.0849	1.5	1.0435	2.0587	1.06	1.2857	
8. Salary Ratio M ^a		1.1	1.0	1.0	1.0	1.05*	1.1	1.09*	
9. Weight Factor W ^b		1.1	1.0849	1.5	1.0435	2.1616	1.166	1.4014	
I. KINDERGARTEN									
10. Portion C		.9630				.0370			
11. Element CW		1.0593				.0801			1.1393
12. CW/Total		.9297				.0703			
II. GRADE 1-5									
10. Portion C			.8519	.0741		.0185		.0556	
11. Element CW			.9242	.1111		.0400		.0779	1.1532
12. CW/Total			.8014	.0964		.0347		.0675	
III. GRADE 5 EXT.FR.									
10. Portion C			.4815		.4259		.0370	.0556	
11. Element CW			.5224		.4445		.0432	.0779	1.0879
12. CW/Total			.4802		.4085		.0397	.0716	

* Average of participating staff.

a. From Table 11.

b. W = M(I + P).

TABLE 16

SCHOOL A, 1976: CLASS TIME ALLOCATION (min. per 5-day cycle)

PROG	CLASS	Z	KGTN CORE	PRIM CORE	JR CORE	FR	MUSIC	LD	TOTAL TIME
I	KGTN a	24	585			100	40		725
	KGTN b	20	585			100	40		725
	Portion C		.8069			.1379	.0552		
II	Gr.1 a	31		1310		100	40		1450
	Gr.1 b	29		1310		100	40		1450
	Gr.2 a	34		1310		100	40		1450
	Gr.2 b	34		1310		100	40		1450
	Gr.3 a	27		1310		100	40		1450
	Gr.3 b	29		1310		100	40		1450
	Portion C			.9035		.0690	.0276		
III	Gr.4 a	30			1290	100	60		1450
	Gr.4 b	29			1290	100	60		1450
	Gr.5 a	34			1290	100	60		1450
	Gr.5 b	36			1290	100	60		1450
	Portion C				.8897	.0690	.0414		
	LD	na						1450	1450
TOTAL		357	1170	7860	5160	1200	560	1450	17400

Average Class Size 29.75

TABLE 17

SCHOOL A, 1976: TEACHER TIME ALLOCATION (min. per 5-day cycle)

N	TEACH	TOTAL TIME	SAL RATIO	P-P TIME	PROGRAM ELEMENTS					MILIEU		
					KG TN CORE	PRIM CORE	JR CORE	FR	MUS	LD	PCR	ADMIN
	KG TN	1450	1.1	280	1170 280							
1	PRIM	1450	1.0	140		1310 140						
5	PRIM	7250	1.0	700		6550 700						
1	JR	1450	1.0	160			1290 160					
3	JR	4350	1.0	480			3870 480					
	LD	1450	na	none						1450		
	FR	1450	1.0	250				1200 250				
	MUS	725	1.1	165					560 165			
	REM	725	1.2	-							725	
	LIB	1450	1.2	-							1450	
	PRIN	1450	1.75	-								1450
INST TIME		17400			1170	7860	5160	1200	560	1450		
P-P TIME				2175	280	840	640	250	165	-		
TOTAL TIME		23200			1450	8700	5800	1450	725	1450	2175	1450

TABLE 18

SCHOOL A, 1976: PROGRAM COST FACTORS

		KGTN CORE	PRIM CORE	JR CORE	FR	MUS	LD	CWF TOTAL
1. Class time	Tc	1170	7860	5160	1200	560	1450	
Teacher time								
2. Instruction	Ti	1170	7860	5160	1200	560		
3. P-P	Tp	280	840	640	250	165		
4. Total	Tt	1450	8700	5800	1450	725	1450	
5. Ti/Tc = I		1.0	1.0	1.0	1.0	1.0	1.0	
6. Tp/Tc = P		.2393	.1069	.1240	.2083	.2946		
7. I + P		1.2393	1.1069	1.1240	1.2083	1.2946	1.0	
8. Salary Ratio M ^a		1.1	1.0	1.0	1.0	1.1	na	
9. Weight factor W ^b		1.3632	1.1069	1.1240	1.2083	1.4241		
I. KINDERGARTEN								
10. Portion C		.8069			.1379	.0552		
11. Element CW		1.1000			.1667	.0786		1.3452
12. CW/Total		.8177			.1239	.0584		
II. PRIMARY								
10. Portion C			.9039		.0690	.0276		
11. Element CW			1.0000		.0833	.0393		1.1226
12. CW/Total			.8908		.0742	.0246		
III. JUNIOR								
10. Portion C				.8897	.0690	.0414		
11. Element CW				1.0000	.0833	.0589		1.1423
12. CW/Total				.8754	.0729	.0516		

a. From Table 11.

b. $W = M(I + P)$.

SCHOOL B (TABLES 19-24)

School B has grades from junior (four-year-old) kindergarten to grade 6, and offers both a regular and a French immersion program. In 1973-74 its enrolment was increasing as new apartment buildings in its sending area were occupied, but since then enrolment has decreased slightly from 594 to 573. However, in 1973 only one child in four was taking immersion, whereas in 1976 two in four took French. About 35 per cent of children from the sending area opt for French immersion, and in addition children come from other areas to take French. In 1976 in grades 1 to 6, 229 were enrolled in the regular program, 225 in immersion. Despite the small overall decline in enrolment, the school has 23 classes, one more than in 1973. The staff has increased also, from 24.75 to 27.4, largely because of a decrease in class size from 27 to 25, and an increase in the amount of p-and-p time relative to class time (the ratio was .094 to 1 in 1973, and .148 to 1 in 1976).

In 1973 grades K through 2 in the regular program received 40 minutes per day of basic French and the higher grades received 20 minutes. In 1976 all regular program classes received 40 minutes per day, except senior kindergarten which got 30 minutes and junior kindergarten which got no French. In the immersion program an hour a day of English language arts was taught in grades 2 through 5 and the program became 50 per cent English, 50 per cent French in grade 6. (The actual times vary because the school day was not evenly divided by the noon break.)

During English to immersion, the French class teachers had some p-and-p time but also taught basic French, and relieved the kindergarten and grade 1 immersion teachers. The attempt to equalize p-and-p time was

not totally successful but in 1976 most teachers in the school received 40 minutes a day. To achieve this a half-time teacher of physical education and music provided some instruction to immersion classes whose teachers instruct basic French.

In 1973 'remediation' for this school was integrated into the classroom teaching. Rather than teaching one or two children separately from their class, the 'remedial' teachers taught regular reading groups at the same time as the class teacher taught other reading groups. Furthermore, the 'remedial' teacher was not routinely assigned the poorer groups. Thus, the cost of these teachers was included in the program costs in 1973, rather than being a milieu cost as was the case in 1976 and in most other schools.

In both years the school provided each grade level of combined grade classes with separate instruction in basic French (1973) and English to immersion (1976). This accounts for the increased costs of the grade 1/2 regular program (III) in 1973 and the grade 1/2 immersion program (IX) in 1976.

With these exceptions and with the exception of the grade 1 to 3 immersion in 1973 (which will be discussed below) the relative costs of the regular and immersion for a grade level for each year are comparable. Regular grade 4 to 6 program (VI), 1973; regular grade 1 to 6 program (IV), 1976; and immersion grade 1, and 2 to 5 programs (VIII and X), 1976, differ from one another by less than one-hundredth of an average teacher's salary. Although the integrated remediation added to the 1973 costs, there was less p-and-p time. The regular grade 2 and 3 programs (IV and V), 1973, were somewhat less. Differences in the senior kindergarten programs in the two years came mainly from the smaller amounts of planning time for these teachers in 1976 (in contrast to the grade 1 to 6 teachers who generally received more p-and-p time).

In 1973 the immersion grade 1 to 3 programs (VIII and IX) were quite a bit more expensive than the regular programs offered at the same grades. The difference was caused by the use of paraprofessionals to assist the immersion teachers in 1973. In costing these programs paraprofessionals are considered as an adjunct of the regular teacher (since they are not certified they cannot be responsible for a class) and the two salaries are added together to get the salary ratio M of 1.25 for this element of the program. This, of course, increases the per class cost.

Paraprofessionals were used to assist the immersion teachers as an alternative to decreasing class size. It was felt that instruction using a second language was more intense, making heavy demands on both the teacher and the students. This was especially the case in the early years of the program when materials were not available and methods were experimental. The decision was to maintain an average class size but lighten the load with lay assistants coming in for half a day. The paraprofessional's salary being half that of a certified teacher's added 25 per cent to the salary costs.

If the increased cost of a paraprofessional was to be justified solely on cost considerations, the difference in class size must be in proportion to the relative cost of the teacher's aide. That is, if the teaching aide adds 25 per cent to the basic teaching cost, class size must be 25 per cent or more larger than the size judged appropriate without an aide if any financial saving is to be made. That is,

$$\frac{M_{t+a}}{M_t} \leq \frac{Z_{t+a}}{Z_t}$$

where M_t is the salary of a teacher alone; M_{t+a} is the salary of teacher plus aide; and Z_t is the size of the class with only a teacher and Z_{t+a} is the size with both an aide and a teacher.

As was noted in Chapter Three, however, the enrolments must be large enough to achieve the larger class sizes. In the School B immersion program in 1973-74 enrolments were still quite small and as a result immersion grade 1 to 3 classes were 15 per cent *smaller* than the regular grade 1 to 3 classes. In addition to dollar costs the fact that these smaller classes had a teacher's aide caused some resentment among regular program teachers.

TABLE 19

SCHOOL B, 1973: CLASS TIME ALLOCATION (min. per 5-day cycle)

PROG	CLASS	Z	J KG TN CORE	S KG TN CORE	1-2 CORE	3 CORE	4-6 CORE	KG TN IMM	1-3 IMM	BASIC FR	ENG	PART FR*	TOTAL
I	RJKa	22	725										725
	RJKb	27	725										725
	Portion C		1.0										
II	RSKa	25		525						200			725
	RSKb	20		525						200			725
	Portion C			.7241						.2759			
III	R1/2	28			1250							200	1450
	Portion C				.8621							.1379	
IV	R2	26			1250					200			1450
	Portion C				.8621					.1379			
V	R3a	28				1350				100			1450
	R3b	28				1350				100			1450
	R3/4	29				1350				100			1450
	Portion C					.9310				.0690			
VI	R4a	27					1350			100			1450
	R4b	29					1350			100			1450
	R5a	33					1350			100			1450
	R5b	31					1350			100			1450
	R5c	33					1350			100			1450
	R6a	31					1350			100			1450
	R6b	31					1350			100			1450
	R6c	30					1350			100			1450
	Portion C						.9310			.0690			
Cont.....													

-105-

TABLE 19 - cont.

PROG	CLASS	Z	J KG TN CORE	S KG TN CORE	1-2 CORE	3 CORE	4-6 CORE	KG TN IMM	1-3 IMM	BASIC FR	ENG	PART FR *	TOTAL	
VII	I K	22						725					725	
	Portion C							1.0						
VIII	I 1	24							1450				1450	
	I 1/2	22							1450				1450	
	Portion C								1.0					
IX	I 2	23							1150		300		1450	
	I 3	25							1150		300		1450	
	Portion C								.7931		.2069		1450	
TOTAL			594	1450	1050	2500	4050	10800	725	5200	1700	600	200	28275

Ave. class size 27.0

* French taught separately to grade 1 and to grade 2 students.

TABLE 20

SCHOOL B, 1973: TEACHER TIME ALLOCATION (min. per cycle)

N	TEACH	TOTAL TIME	SAL RATIO	P-P TIME	J KGTN CORE	S KGTN CORE	PROGRAM ELEMENTS									
							1-2 CORE	3 CORE	4-6 CORE	KGTN FI	1-3 FI	BASIC FR	ENG	PART FR	PCR	ADM
	KA	725	1.1	None	725											
	KB	1450	1.1	200	725 116	525 84										
	KC	725	1.1	200		525 200										
	CLASS 1-2	1450	1.0	100			1250 100									100
	CLASS 1-2	1450	1.0	100			1350 100									100
	CLASS 3	1450	1.0	100			1350 100									
2	CLASS 3	2900	1.0	200			2700 200									
	CLASS 4-6	1450	1.0	100					1350 100							
7	CLASS 4-6	10150	1.0	700					9450 700							
	FIK	725	1.1	150						575 150						

cont....

TABLE 20 - cont.

N	TEACH	TOTAL TIME	SAL RATIO	P-P TIME	J KGTN CORE	S KGTN CORE	PROGRAM ELEMENTS						BASIC FR	ENG	PART FR	MILIEU	
							1-2 CORE	3 CORE	4-6 CORE	KGTN FI	1-3 FI	PCR				ADM	
	FIA	1450	1.25*	None								1450					
	FIB	1450	1.25*	None								1450					
	FIC	1450	1.25*	150						150 17	1150 133						
	FID	1450	1.25*	100							1150 85				200 15		
	FRA	1450	1.0	350								1100 350					
	FRB	1000	1.0	200								600 150			200 50		
	ETF	725	1.0				50	75					600				
	LIB	1450	1.2													1450	
	VP	1450	1.4						725								725
	PRIN	1450	1.75														1450
INST TIME		29325			1450	1050	2550	4125	11525	725	5200	1700	600		400		
P-P TIME				2650	116	284	200	300	800	167	218	500	---		65		
TOTAL TIME		35800			1566	1334	2750	4425	12325	892	5418	2200	600		465	1650	2175

* Includes a half-time paraprofessional.

TABLE 21

SCHOOL B, 1973: PROGRAM COST FACTORS

DESCRIPTION		J KG TN CORE	S KG TN CORE	1-2 CORE	3 CORE	A-6 CORE	KG TN IMM	1-3 IMM	BASIC FR	ENG	PART FR	CWF TOTAL
1. Class Time	Tc	1450	1050	2500	4050	10800	725	5200	1700	600	200	
Teacher Time												
2. Instruction	Ti	1450	1050	2550	4125	11525	725	5200	1700	600	400	
3. P-P	TP	116	284	200	300	800	167	218	500	--	65	
4. Total	Tt	1566	1334	2750	4425	12325	892	5418	2200	600	465	
5. Ti/Tc = I		1.0	1.0	1.02	1.0185	1.0671	1.0	1.0	1.0	1.0	2.0	
6. Tp/Tc = P		.08	.2705	.08	.0741	.0741	.2304	.0419	.2941	--	.325	
7. I + P		1.08	1.2705	1.10	1.0926	1.1412	1.2304	1.0419	1.2941	1.0	2.325	
8. Salary Ratio M ^a		1.1	1.1	1.0	1.0	1.0	1.1	1.25*	1.0	1.0	1.0	
9. Weight Factor W ^b		1.188	1.3975	1.1	1.0926	1.1412	1.3534	1.3024	1.2941	1.0	2.325	
I. REG. JR.KG TN												
10. Portion C		1.0										
11. Element Cost CW		1.188										1.1880
12. CW/Total		1.000										
II. REG. SR.KG TN												
10. Portion C			.7241									
11. Element Cost CW			1.0120						.2759			
12. CW/Total			.7392						.3570			1.3690
									.2608			
III. REG. GRADE 1/2												
10. Portion C				.8621							.1379	
11. Element Cost CW				.9483							.3207	1.2690
12. CW/Total				.7473							.2527	

cont....

TABLE 21 - cont.

DESCRIPTION	J KG TN CORE	S KG TN CORE	1-2 CORE	3 CORE	4-6 CORE	KG TN IMM	1-3 IMM	BASIC FR	ENG	PART FR	CWF TOTAL
IV. REG. GRADE 2											
10. Portion C			.8621					.1379			
11. Element Cost CW			.9483					.1785			1.1268
12. CW/Total			.8416					.1584			
V. REG. GRADE 3											
10. Portion C				.9310				.0690			
11. Element Cost CW				1.0172				.0893			1.1065
12. CW/Total				.9193				.0807			
VI. REG. GRADE 4-6											
10. Portion C					.9310			.0690			
11. Element Cost CW					1.0625			.0893			1.1518
12. CW/Total					.9225			.0775			
VII. FI SR.KG TN											
10. Portion C						1.0					
11. Element CW						1.3534					1.3534
12. CW/Total						1.00					
VIII. FI GRADE 1-1/2											
10. Portion C							1.0				
11. Element CW							1.3024				1.3024
12. CW/Total							1.00				
IX. FI GRADE 2-3											
10. Portion C							.7931		.2069		
11. Element Cost CW							1.0329		.2069		1.2398
12. CW/Total							.8331		.1669		

* Ratio includes salary of lay teacher. See text.

a. From Table 11. b. $W = M(1 + P)$.

TABLE 22

SCHOOL B, 1976: CLASS TIME ALLOCATION (Min. per 6-day cycle)

PROG.	CLASS	Z	KG TN CORE	1-6 CORE	BASIC FR	PE	KG TN FI	1-5 FI	6 FR	6 ENG	PART ENG*	ENG	PE/ MUS	LD	TOTAL
I	RJKA Portion C	20	900 1.0												900
II	RJKP Portion C	19	840 1.0												840
III	RSK Portion C	16	720 .8000		180 .2000										900
IV	R1	19		1500	240										1740
	R1/2a	26		1530	210										1740
	R1/2b	26		1530	210										1740
	R2/3	27		1500	240										1740
	R3/4	30		1500	240										1740
	R4/5	29		1500	240										1740
	R5	26		1500	240										1740
	R6a	27		1500	240										1740
	Portion C			.8621	.1379										1740
V	R6b	27		1320	240	180									1740
				.7586	.1379	.1034									
VI	ISKA Portion C	22					900 1.0								900
VII	ISKPa	16					840								840
	ISKPb	18					840								840
	Portion C						1.0								

Cont...

TABLE 22 - cont.

PROG.	CLASS	Z	KGTN CORE	1-6 CORE	BASIC FR	PE	KGTN FI	1-5 FI	6 FR	6 ENG	FART ENG*	ENG	PE/ MUS	LD	TOTAL
VIII	I1a	28						1680					60		1740
	I1b	28						1680					60		1740
	Portion C							.9655					.0345		
IX	I1/2	27						1320			360		60		1740
	Portion C							.7586			.2069		.0345		
X	I2/3	29						1320				360	60		1740
	I3/4	29						1320				360	60		1740
	I4	32						1320				360	60		1740
	I5	29						1320				360	60		1740
XI	I6	23							900	840					1740
	Portion C							.5172	.4828						
XII	LD	na				180								1560	1740
TOTAL		573	2460	13380	2280	360	2580	9960	900	840	360	1440	420	1560	36540

Average Class Size 24.9

*ENG taught to grade 2 only of grade 1/2 class.

TABLE 23

SCHOOL B, 1976: TEACHER TIME ALLOCATION (min. per 6-day cycle)

N	TEACH	TOTAL TIME	SAL RATIO	P-P TIME	KG TN CORE	1-6 CORE	BASIC FR	PE	KG TN FI	1-5 FI	6 FR	6 ENG	PART ENG	ENG	PE/ MUS	LD	PCR	ADM
	IKA	1740	1.1	180	1560 180													
	EKB	900	1.1	90	810 90													
	EPA	1740	1.0	210		1530 210												
	EPB	1740	1.0	210		1530 210												
	EPC	1740	1.0	240		1500 240												
2	EP	3480	1.0	480		3000 480												
	EJA	1740	1.0	240		1500 240												
2	EJ	3480	1.0	480		3000 480												
	EJC	1740	1.0	240		1320 240												
	FKA	1740	1.1	180					1560 180									

cont....

TABLE 23 - cont. (1)

N	TEACH	TOTAL TIME	SAL RATIO	P-P TIME	KG TN CORE	1-6 CORE	BASIC FR	PE	KG TN FI	1-5 FI	6 FR	6 ENG	PART ENG	ENG	PE/ MUS	LD	PCR	ADM
FKB		870	1.1	30					840 30									
FPA		1740	1.0	240						1500 240								
FPB		1740	1.0	240						1500 240								
FPC		1740	1.0	240						1320 211			180 29					
FPD		1740	1.0	240						1320 211			180 29					
FPE		1740	1.0	240						1500 240								
FJA		1740	1.0	240			180 29			1320 211								
FJB		1740	1.0	240						1500 240								
FJC		1740	1.0	180			660 76				900 104							
EJF		1740	1.0	180								840 97		720 83				

cont.....

TABLE 23 - cont. (2)

N	TEACH	TOTAL TIME	SAL RATIO	P-P TIME	KG TN CORE	1-6 CORE	BASIC FR	PE	KG TN FI	1-5 FI	6 FR	6 ENG	PART ENG	ENG	PE/ MUS	LD	PCR	ADM
LIB		1740	1.2	-													1740	
ENG		1740	1.0	180	90 14								360 55	720 111			390	
FR		1740	1.0	300*			1440 300											
FX		720	1.0	120					180 36						420 84			
VP		1740	1.4					360										1380
SPE		1740	1.2	180												1560 180		
PRIN		1740	1.75															1740
INSTRUCT																		
TIME		36900			2460	13380	2280	360	2580	9960	900	840	720	1440	420	1560		
P-P TIME				5400	284	2100	405	-	246	1593	104	97	113	194	84	180		
TOTAL																		
TIME		47730			2744	15480	2685	360	2826	11553	1004	937	833	1634	504	1740	2130	3300

* Includes time to move from class to class.

TABLE 24

SCHOOL B, 1976: PROGRAM COST FACTORS

		KGTN CORE	1-6 CORE	BASIC FR	PE	KGTN FI	1-5 FI	6 FR	6 ENG	PART ENG	ENG	PE/ MUS	CWF TOTAL
1. Class Time	Tc	2460	13380	2280	360	2580	9960	900	840	360	1440	420	
Teacher Time													
2. Instruction	Ti	2460	13380	2280	360	2580	9960	900	840	720	1440	420	
3. P-P	TP	284	2100	405		246	1593	104	97	113	194	84	
4. Total	Tt	2744	15480	2685	360	2826	11553	1004	937	833	1634	504	
5. Ti/Tc = I		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	
6. Tp/Tc = P		.1154	.1569	.1776	0	.0954	.1599	.1155	.1155	.1569	.1347	.2000	
7. I + P		1.1154	1.1569	1.1776	1.0	1.0954	1.1599	1.1155	1.1155	2.1569	1.1347	1.2000	
8. Salary ratio M ^a		1.1	1.0	1.0	1.05	1.1	1.0	1.0	1.0	1.0	1.0	1.0	
9. Weight factor W ^b		1.2270	1.1569	1.1776	1.05	1.2049	1.1599	1.1155	1.1155	2.1569	1.1347	1.2000	
I. AM JR KGTN													
10. Portion C		1.0											
11. Element CW		1.2270											1.2270
12. CW/Total		1.0											
II. PM JR KGTN													
10. Portion C		1.0											
11. Element CW		1.2270											1.2270
12. CW/Total		1.0											
III. REG. S KGTN													
10. Portion C		.8		.2									
11. Element CW		.9816		.2355									1.2171
12. CW/Total		.8065		.1935									

cont.....

TABLE 24 - cont. (1)

	KGTN CORE	1-6 CORE	BASIC FR	PE	KGTN FI	1-5 FI	6 FR	6 ENG	PART ENG	ENG	PE/ MUS	CWF TOTAL
IV. REG. 1-6												
10. Portion C		.8621	.1379									
11. Element CW		.9974	.1624									
12. CW/Total		.8599	.1400									1.1598
V.												
10. Portion C		.7586	.1379	.1034								
11. Element CW		.8777	.1624	.1086								
12. CW/Total		.7640	.1414	.0946								1.1487
VI. FI AM KGTN												
10. Portion C					1.0							
11. Element CW					1.2049							
12. CW/Total					1.0							1.2049
VII. FI PM KGTN												
10. Portion C					1.0							
11. Element CW					1.2049							
12. CW/Total					1.0							1.2049
VIII. FI GR.1												
10. Portion C						.9655					.0345	
11. Element CW						1.1199					.0414	1.1613
12. CW/Total						.9644					.0356	
IX. FI GR.1/2												
10. Portion C						.7586			.2069		.0345	
11. Element CW						.8799			.4463		.0414	1.3676
12. CW/Total						.6434			.3263		.0313	

cont....

TABLE 24 - cont. (2)

	KGTN	1-6	BASIC		KGTN	1-5	6	6	PART	PE/	CWF	
	CORE	CORE	FR	PE	FI	FI	FR	ENG	ENG	ENG	MUS	TOTAL
X. FI GR.2-5												
10. Portion C						.7586				.2069	.0345	
11. Element CW						.8799				.2348	.0414	1.1561
12. CW/Total						.7611				.2031	.0358	
XI. FI GR.6												
10. Portion C							.5172	.4828				
11. Element CW							.5770	.5385				1.1155
12. CW Total							.5173	.4827				

a. From Table 11.

b. $W = M(1+P)$.

SCHOOL C (TABLES 25-30)

School C is an aging urban school whose enrolment has been declining for over a decade. It has a junior and senior kindergarten and four classes from grades 1 to 6. The junior kindergarten class gets no French, and the senior kindergarten has 30 minutes per day of basic French. In 1973 the grade 1/2 and the grade 2 students in the grade 2/3 class received 40 minutes per day, while the rest of the students received 20 minutes per day basic French. This left the half-time French teacher with no planning time. In 1976 the 40-minute program has been implemented in all grades and the full-time French teacher receives an hour a day of p-and-p time. The options program which was run by the grade 4/5 and 5/6 teachers with the help of volunteers from the community in 1973 is not offered in 1976. However, parents still come into the school to run the library in the afternoons. Classes are not scheduled into the library, but may use it whenever convenient.

The cost of the programs in the school have risen because of the increased p-and-p time allowed for class teachers and the French teacher. In 1973 the ratio of p-and-p time to class instruction time was .111 to 1.0, while in 1976 it is .152 to 1.0. The effect of the increase in p-and-p time given to class teachers as a result of the 40-minute French program can also be seen in 1973 by comparing the grade 1/2 program (III) relative cost of 1.1206 with those of the grade 4 to 6 program (V) relative cost of 1.0907. Note also that the relatively high cost of the 1973 grade 2/3 program (IV) is because of the splitting of the combined grade class for part of basic French. The amount of pupil contact resource time relative to class instruction time has also increased, but administrative time has been reduced considerably in relation to class instruction time, from a ratio of .160 to 1 to .088 to 1.

TABLE 25

SCHOOL C, 1973: CLASS TIME ALLOCATION (min. per 5-day cycle)

PROG	CLASS	Z	J KG TN CORE	S KG TN CORE	1-3 CORE	4-6 CORE	BASIC FR	PART FR*	LIB	OPT	TOTAL
I	JK Portion C	15	720 .96						30 .04		750
II	SK Portion C	16		570 .76			150 .20		30 .04		750
III	1/2 Portion C	30			1270 .8467		200 .1333		30 .02		1500
IV	2/3 Portion C	31			1270 .8467		100 .0667	100 .0667	30 .02		1500
V	4/5 5/6 Portion C	30 31				1340 1340 .8983	100 100 .0667		30 30 .02	30 30 .02	1500 1500
TOTAL		153	720	570	2540	2680	650	100	180	60	7500

Average class size 25.5

* French taught only to grade 2 students of a grade 2/3 class. Class teacher teaches grade 3 students at same time.

-120-

TABLE 26

SCHOOL C, 1973: TEACHER TIME ALLOCATION (min. per cycle)

N	TEACH	TOTAL TIME	SAL. RATIO	P-P TIME	Program Elements								Milieu	
					J KG TN CORE	S KG TN CORE	1-3 CORE	4-6 CORE	BASIC FR	PART FR	LIB	OPT	PCR	ADM
	K	1500	1.1	210	720 105	570 105								
	1/2	1500	1.1	230			1270 230							
	2/3	1500	1.0	130			1270 120			100 10				
	4/5	1500	1.0	130				1340 130				30		
	5/6	1500	1.0	130				1340 130				30		
	LIB	750	1.2								180		570	
	PRIN	1500	1.75										300	1200
	FR	750	1.0						650	100				
INST TIME 7,600					720	570	2540	2680	650	200	180	60		
P-P TIME 830					105	105	350	260	-	10	-	-		
TOTAL TIME 10,500					825	675	2890	2940	650	210	180	60	870	1200

-121-

TABLE 27

SCHOOL C, 1973: PROGRAM COST FACTORS

DESCRIPTION	J KG TN	S KG TN	1-3 CORE	4-6 CORE	BASIC FR	PART FR	LIB	OPT	CWF TOTAL
1. Class time Tc	720	570	2540	2680	650	100	180	60	
Teacher time									
2. Instruction Ti	720	570	2540	2680	650	200	180	60	
3. P-P Tp	105	105	350	260	-	10	-	-	
4. Total time Tt	825	675	2890	2940	650	210	180	60	
5. Ti/Tc = I	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	
6. Tp/Tc = P	.1458	.1842	.1378	.0970	-	.10	-	-	
7. I + P	1.1458	1.1842	1.1378	1.0970	1.0	2.10	1.0	1.0	
8. Salary Ratio M ^a	1.1	1.1	1.0	1.0	1.0	1.0	1.2	1.0	
9. Weight Factor W ^b	1.2604	1.3026	1.1378	1.0970	1.0	2.10	1.2	1.0	
I. KINDERGARTEN									
10. Portion C	.9600						.04		
11. Element Cost CW	1.2100						.048		1.2580
12. CW/Total	.9618						.0382		
II. KINDERGARTEN									
10. Portion C		.7600					.04		
11. Element Cost CW		.9900					.048		1.2380
12. CW/Total		.8049			.1626		.0390		
III. GRADE 1/2									
10. Portion C			.8467		.1333		.02		
11. Element Cost CW			.9633		.1333		.024		1.1206
12. CW/Total			.8596		.1190		.0214		

Cont.....

TABLE 27 - cont.

DESCRIPTION	J KGTN	S KGTN	1-3 CORE	4-6 CORE	BASIC FR	PART FR	LIB	OPT	CWF TOTAL
IV. GRADE 2/3									
10. Portion C			.8467		.0667	.0667	.02		
11. Element Cost CW			.9633		.0667	.1399	.024		1.1940
12. CW/Total			.8069		.0558	.1173	.0201		
V. GRADES 4/5 AND 5/6									
10. Portion C				.8933	.0667		.02	.02	
11. Element Cost CW				.9800	.0667		.024	.02	1.0907
12. CW/Total				.8985	.0611		.0220	.0183	

a. From Table 11.

b. $W = M(I + P)$.

TABLE 28

SCHOOL C, 1976: CLASS TIME ALLOCATION (min. per 5-day cycle)

PROG	CLASS	Z	KGTN CORE	1-6 CORE	BASIC FR	SP.ED. FR.	TOTAL
I	Jr K Portion C	14	675 1.0				675
II	Sr K Portion C	15	550 .7333		200 .2667		750
III	1/2	22		1225	200		1425
	2/3	26		1225	200		1425
	4/5	28		1225	200		1425
	5/6	30		1225	200		1425
	Portion C			.8597	.1404		
	LD	na				1300 125	1425
TOTAL		135	1225	4900	1000	1300 125	8550

Average class size 22.5

TABLE 29

SCHOOL C, 1976: TEACHER TIME ALLOCATION (min. per cycle)

N	TEACH	TOTAL TIME	SAL. RATIO	P-P TIME	KG TN CORE	1-6 CORE	BASIC FR	SP.ED. FR.	PCR	ADMIN
	K	1425	1.1	200	1225 200					
	PA	1425	1.0	200		1225 200				
	PB	1425	1.0	200		1225 200				
	PC	1425	1.0	200		1225 200				
	VP	1425	1.4	-		675				750
	PD	750	1.0	200		550 200				
	LD	1425		-				1300	125	
	FR	1425	1.0	300			1000 267	125 33		
	LIB	750	1.2	-					750	
	REM	405	1.2	-					405	
	SPEECH	135	1.2	-					135	
INSTRUCT P-P		8,675		1300	1225 200	4900 800	1000 267	1300 --	250 33	
TOTAL		12,015			1425	5700	1267	1300	283	1290 750

TABLE 30

SCHOOL C, 1976: PROGRAM COST FACTORS

		KGTN CORE	1-6 CORE	BASIC FR	CWF TOTAL
1. Class time	TC	1225	4900	1000	
Teacher time					
2. Instruction	Ti	1225	4900	1000	
3. P-P	Tp	200	800	267	
4. Total time	Tt	1425	5700	1267	
5. Ti/Tc	I	1.0	1.0	1.0	
6. Tp/Tc	P	.1633	.1633	.267	
7. I	P	1.1633	1.1633	1.267	
8. Salary ratio M	^a	1.1	1.0	1.0	
9. Weight factor W	^b	1.2796	1.1633	1.267	
I. KINDERGARTEN					
10. Portion C		1.0			
11. Element CW		1.2796			1.2796
12. CW/Total		1.0			
II. KINDERGARTEN					
10. Portion C		.7333		.2667	
11. Element CW		.9384		.3379	1.2762
12. CW/Total		.7353		.2647	
III. GRADE 1-6					
10. Portion C			.8596	.1403	
11. Element CW			1.0000	.1778	1.1778
12. CW/Total			.8490	.1510	

a. From Table 11.

b. $W = M(I + P)$.

SCHOOL D (TABLES 31-36)

School D combines a middle school and an elementary school in one building. The bussing schedule requires that elementary and intermediate students begin and end their day at the same time, but recesses make the elementary instruction time shorter.

In 1973 the school had an extended French program at two grade levels in which about a third of the students from two classes took basic French and environmental studies in French from a teacher who came into the school especially to teach this program. The remainder of the two classes took environmental studies in English from their home teacher and basic French from the regular French teacher during this hour. Because the four classes were reduced in size for this period, costs were increased for both the extended program and the program for students in these classes not opting for the extended program.

School D is the only school in this group where the ratio of p-and-p time to class instruction time has decreased (from .263 to .161 to 1), and the only one where the ratio of resource teacher time has decreased (from .110 to .026 to 1). All its programs in 1973, either in elementary or middle grades, cost considerably more than programs at similar grade levels in other schools. The small class sizes for some program elements like extended French and a special, partly remedial program in grade 8 (IX), together with the amount of planning time, made the programs cost more. In 1976 the class teacher provides physical education, and the extended and special grade 8 programs are no longer offered. A comparison of line 6 (Tp) in Table 33 with line 6 in Table 36 indicates that planning time for all program elements has been reduced to levels more like those of other schools shown.

The difference between elementary costs and middle or intermediate school costs should also be noted. The middle school program attempts to provide enrichments of the basic curriculum with subjects like industrial arts and home economics. There is a tendency for these extra subjects to allow more planning time for teachers. Principals of both middle schools examined here arranged p-and-p time so that middle school teachers could meet to discuss student and curriculum needs on a regular basis. Extra planning time does add to costs. In addition, School D is attempting to offer a middle school program to a small enrolment which makes maximum utilization of specialists difficult. Industrial arts and home economics are presented to half classes at this school, which adds to costs.

It should also be noted, however, that higher costs per class are offset by large class sizes, so that overall costs per pupil are kept down.

TABLE 31

SCHOOL D, 1973: CLASS TIME ALLOCATION (minutes per 6-day cycle)

PROG.	CLASS	Z	KGTN CORE	ELEM. CORE	INT. CORE	OPP CORE	BASIC FR.	ENG.ES EXT.FR*	LIB.	ELEM. PE	INT. PE	MUSIC	IA/HE	SPEC	TOTAL
I	Ka	18	710				120			20		20			870
	Portion C		.8161				.1379			.0230		.0230			
II	Kb	18	660				120		30	30		30			870
	Portion C		.7856				.1379		.0345	.0345		.0345			
III	1	25		1510			120		30	30		50			1740
	1/2	19		1510			120		30	30		50			1740
	2	33		1510			120		30	30		50			1740
	Portion C			.8678			.0690		.0172	.0172		.0287			
IV&V	3	34		1260				360	30	30		60			1740
	3/4	36		1260				360	30	30		60			1740
	4/5	35		1260				360	30	30		60			1740
	5	36		1260				360	30	30		60			1740
	Portion C			.7241				.2069	.0172	.0172		.0345			
VI	JO	10				1560	120			30		30			1740
VII	6a	35			1290		180		30		120	60	120		1800
	6b	36			1290		180		30		120	60	120		1800
	7a	35			1290		180		30		120	60	120		1800
	7b	35			1290		180		30		120	60	120		1800
	8a	39			1290		180		30		120	60	120		1800
	Portion C				.7167		.1000		.0167		.0667	.0333	.0667		
VIII	6c	31			1230		180		30		180	60	120		1800
	Portion C				.6833		.1000		.0167		.1000	.0333	.0667		

Cont....

TABLE 31 - cont.

PROG.	CLASS	Z	KGTN CORE	ELEM. CORE	INT. CORE	OPP CORE	BASIC FR.	ENG.ES. EXT.FR *	LIB	ELEM. PE	INT. PE	MUSIC	IA/HE	SPEC	TOTAL
IX	8b	39			750		180	30			120	60	120	540	1800
	Portion C				.4167		.1000	.0167			.0667	.0333	.0667	.3000	
X	SO	17				1290	180	30			120	60	120		1800
TOTAL		531	1370	9570	8430	2850	2160	1440	480	290	1020	950	960	540	30060

Average Class Size 29.5

* Some students take environmental studies in English, some in French, and these groups take Basic French separately.

TABLE 32

SCHOOL D, 1973: TEACHER TIME ALLOCATION (minutes per cycle)

N	TEACH	TOTAL TIME	SAL. RATIO	P-P TIME	Program Elements												Milieu	
					KGTN CORE	ELEM CORE	INT CORE	OPP CORE	BASIC FR.	ENG.ES EXT.FR	LIB	ELEM PE	INT PE	MUSIC	IA/HE	SPEC	PCR	ADMIN
	K	1740	1.1	370	1370 370													
1	CLASS 1-2	1740	1.0	230		1510 230												
2	CLASS 1-2	3480	1.0	460		3020 460												
1	CLASS 3-5	1740	1.0	240		1260 202				240 38								
3	CLASS 3-5	5220	1.0	720		3780 606				720 114								
	JO	1740		180				1560 180										
	INT A	1800	1.2	450			1290 430						60 20					
	INT B	1800	1.2	510			1290 510											
	INT C	1800	1.2	450			1230 410						120 40					

cont...

TABLE 32 - cont. 1

N	TEACH	TOTAL TIME	SAL. RATIO	P-P TIME	Program Elements												Milieu	
					KG TN CORE	ELEM CORE	INT CORE	OPP CORE	BASIC FR.	ENG.ES EXT.FR	LIB	ELEM PE	INT PE	MUSIC	IA/HE	SPEC	PCR	ADMIN
	INT D	1800	1.2	450			1350 450											
	INT E	1800	1.2	450			1230 410						120 40					
	INT F	1800	1.2	360			1020 255						120 30			300 75		
	INT G	1800	1.2	420			1020 310						120 37			240 73		
	INT H	1800	1.2	390			1290 357						120 33					
	MUS A	580	1.1	120										460 120				
	MUS B	720	1.1	230										490 230				
	FR A	1740	1.0	540					720 324	480 216								
	FR B	1800	1.0	360					1440 360									
	FR C	870	1.0	150						720 150								

cont...

TABLE 32 - cont. 2

					Program Elements												Milieu	
N	TEACH	TOTAL TIME	SAL. RATIO	P-P TIME	KCTN CORE	ELEM CORE	INT CORE	OPP CORE	BASIC FR.	ENG.ES EXT.FR	LIB	ELEM PE	INT PE	MUSIC	IA/HE	SPEC	PCR	ADMIN
	IA	1200	1.3	240											960 240			
	HE	1200	1.3	240											960 240			
	PE	1800	1.05	250								290 47	1020 164			240 39		
	LIB	900	1.2								480						420	
	VP	1800	1.4	240									360 55			300 46		900 139
	REM A	1080	1.2														1080	
	REM B	1800	1.2														1800	
	PRIN	1800	1.75															1800
INST TIME 33,300					1370	9570	8430	2850	2160	2160	480	290	2040	950	1920	1080		2700
P-P TIME 8050					370	1498	2775	537	684	518	--	47	419	350	480	233		139
TOTAL 47,350					1740	11068	11205	3387	2844	2678	480	337	2459	1300	2400	1313	3300	2839

TABLE 33

SCHOOL D, 1973: PROGRAM COST FACTORS

	KGTN CORE	ELEM. CORE	INT. CORE	OPP CORE	BASIC FR.	ENG.ES Ext.Fr	LIB.	ELEM. PE	INT. PE	MUSIC	IA/HE	SPEC	CWF TOTAL
1. Class Time Tc Teacher Time	1370	9570	8430	2850	2160	1440	480	290	1020	950	960	540	
2. Instruction Ti	1370	9570	8430	2850	2160	2160	480	290	2040	950	1920	1080	
3. P-P Tp	370	1498	2775	537	684	518	-	47	419	350	480	233	
4. Total Tt	1740	11068	11205	3387	2844	2678	480	337	2459	1300	2400	1313	
5. Ti/Tc = I	1.0	1.0	1.0		1.0	1.5	1.0	1.0	2.0	1.0	2.0	2.0	
6. Tp/Tc = P	.2701	.1565	.3292		.3167	.3597	--	.1621	.4108	.3684	.5	.4315	
7. I + P	1.2701	1.1565	1.3292		1.3167	1.8597	1.0	1.1621	2.4108	1.3684	2.5	2.4315	
8. Salary Ratio ^a	1.1	1.0	1.2		1.0	1.0	1.2	1.05	1.05	1.1	1.3	1.2	
9. Weight Factor ^b	1.3971	1.1565	1.5950		1.3167	1.8597	1.2	1.2202	2.5315	1.5053	3.25	2.9178	
I. KINDERGARTEN													
10. Portion C	.8161				.1379			.0230		.0230			
11. Element CW	1.1402				.1816			.0281		.0346			1.3844
12. CW/Total	.8236				.1312			.0203		.0250			
II. KINDERGARTEN													
10. Portion C	.7546				.1379		.0345	.0345		.0345			
11. Element CW	1.0599				.1816		.0414	.0421		.0519			
12. CW/Total	.7698				.1319		.0301	.0306		.0377			1.3768
III. GRADES 1-2													
10. Portion C		.8678			.0690		.0172	.0172		.0287			
11. Element CW		1.0037			.0908		.0207	.0210		.0433			
12. CW/Total		.8510			.0770		.0175	.0178		.0367			1.1794

Cont....

TABLE 33 - cont.

	KGTN CORE	ELEM. CORE	INT. CORE	OPP CORE	BASIC FR.	ENG.ES EXT.FR.	LIB.	ELEM. PE	INT. PE	MUSIC	IA/HE	SPEC	CWF TOTAL
IV. & IV. GRADES 3-5													
10. Portion C		.7241				.2069	.0172	.0172		.0345			
11. Element CW		.8375				.3848	.0207	.0210		.0519			
12. CW/Total		.6364				.2924	.0157	.0160		.0394			1.3159
VII. GRADES 6-8													
10. Portion C			.7167		.1000		.0167		.0667	.0333	.0667		
11. Element CW			1.1431		.1317		.0200		.1688	.0502	.2167		1.7304
12. CW/Total			.6606		.0761		.0116		.0975	.0290	.1252		
VIII. GRADE 6													
10. Portion C			.6833		.1000		.0167		.1000	.0333	.0667		
11. Element CW			1.0899		.1317		.0200		.2531	.0502	.2167		1.7616
12. CW/Total			.6187		.0747		.0114		.1437	.0285	.1230		
IX. GRADE 8													
10. Portion C			.4167		.1000		.0167		.0667	.0333	.0667	.3000	
11. Element CW			.6646		.1317		.0200		.1688	.0502	.2167	.8753	2.1272
12. CW/Total			.3124		.0619		.0094		.0793	.0236	.1019	.4115	

a. From Table 11.

b. $W = M(1+P)$.

TABLE 34

SCHOOL D, 1976: CLASS TIME ALLOCATION (minutes per 6-day cycle)

Prog.	Class	Z	KGTN CORE	1-2 CORE	3-5 CORE	ELEM. FR.	MUSIC	LIBRARY	INT. CORE	INT. FR.	IA	HE	SP.ED.	TOTAL
I	KINDERGTN portion C	32	1540 .9506				40 .0247	40 .0247						1620
II	GRADE 1	32		1420		120	40	40						1620
	" 1/2	21		1420		120	40	40						1620
	" 2	31		1420		120	40	40						1620
	portion C			.8765		.0741	.0247	.0247						
III	GRADE 3	38			1400	120	40	60						1620
	" 4	38			1400	120	40	60						1620
	" 5	37			1400	120	40	60						1620
	portion C				.8642	.0741	.0247	.0370						
IV	GRADE 6a	30					30	60	1360	200	90	60		1800
	" 6b	31					30	60	1360	200	90	60		1800
	" 6c	31					30	60	1360	200	90	60		1800
	" 7a	37					30	60	1360	200	90	60		1800
	" 7b	37					30	60	1360	200	90	60		1800
	" 7c	37					30	60	1360	200	90	60		1800
	" 8a	39					30	60	1360	200	90	60		1800
	" 8b	38					30	60	1360	200	90	60		1800
	portion C						.0167	.0333	.7555	.1111	.05	.0333		
V	SP.ED. SLD	(10)				120	40	60					1400	1620
	PSE	(11)				120	40	60					1400	1620
	ISE	(13)				150	30	60			180	60	1320	1800
TOTAL		509	1540	4260	4200	1110	630	1000	10880	1600	900	540	4120	30780

Average Class Size 33.9

TABLE 35

SCHOOL D, 1976: TEACHER TIME ALLOCATION (minutes per cycle)

N	TEACH	TOTAL TIME	SAL RATIO	P-P TIME	Program Elements											Milieu	
					KG TN CORE	1-2 CORE	3-5 CORE	ELEM. FR.	MUSIC	LIB.	INT. CORE	INT. FR.	IA	HE	SP.ED.	PCR	ADMIN.
	KGTN	1620	1.1	80	1540 80												
	PRIM.	1620	1.0	200		1420 200											
2	PRIM	3240	1.0	400		2840 400											
	JR.	1620	1.0	220			1400 220										
2	JR.	3240	1.0	440			2800 440										
	INT.	1800	1.2	290							1360 261		90 17	60 12			
5	INT.	9000	1.2	1450							6800 1305		450 85	300 60			
	FR. A	1800	1.0	90				1110 58				600 32					
	FR. B	1800	1.0	140							570 48	1000 84	90 8				

Cont....

TABLE 35 - cont.

N		TEACH	TOTAL TIME	SAL. RATIO	P-P TIME	Program Elements										Milieu	
						KGTN CORE	1-2 CORE	3-5 CORE	ELEM. FR.	MUSIC	LIB.	INT. CORE	INT. FR.	IA	HE	SP.ED.	PCR
		MUSIC	1800	1.1	320					630 136		790 171			60 13		
		IA	1800	1.3	270							570 100		900 159	60 11		
		HE	1800	1.3	380							790 211		90 24	540 145		
		LIB	1800	1.2							1000					800	
		VP	1800	1.4													1800
		PRIN	1800	1.75													1800
		SLD	1620	NA	220											1400 220	
		PSE	1620	NA	220											1400 220	
		ISE	1800	NA	240									180 28	60 9	1320 203	
INST TIME		32,220				1540	4260	4200	1110	630	1000	10880	1600	1800	1080	4120	
P-P TIME				4960		80	600	660	58	136	--	2096	116	321	250	643	
TOTAL		41,580				1620	4860	4860	1168	766	1000	12976	1716	2121	1330	4763	800 3600

TABLE 36

SCHOOL D, 1976: PROGRAM COST FACTORS

		Program Elements									CWF TOTAL		
		KGTN CORE	1-2 CORE	3-5 CORE	ELEM. FR	MUSIC	LIB.	INT. CORE	INT. FRENCH	IA		HE	
1. Class time	Tc	1540	4260	4200	1110	630	1000	10880	1600	900	540	1.1626	
Teacher time													
2. Instruction	Ti	1540	4260	4200	1110	630	1000	10880	1600	1800	1080		
3. P-P	Tp	80	600	660	58	136	--	2096	116	321	250		
4. Total Time	Tt	1620	4860	4860	1168	766	1000	12976	1716	2121	1330		
5. Ti/Tc = I		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0		
6. Tp/Tc = P		.0520	.1409	.1571	.0522	.2159	-	.1926	.0725	.3567	.4630		
7. I + P		1.0520	1.1409	1.1571	1.0522	1.2159	1.0	1.1926	1.0725	2.3567	2.4630		
8. Salary ratio M ^a		1.1	1.0	1.0	1.0	1.1	1.2	1.2	1.0	1.25*	1.25*		
9. Weight Factor W ^b		1.1571	1.1409	1.1571	1.0522	1.3375	1.2	1.4312	1.0725	2.9458	3.0787		
I. KINDERGARTEN													
10. Portion C		.9506				.0247	.0247						
11. Element CW		1.100				.0330	.0296						
12. CW/Total		.9461				.0284	.0255						
II. GRADES 1-2													
10. Portion C		.8765			.0741	.0247	.0247						
11. Element CW		1.0			.0779	.0330	.0296						
12. CW/Total		.8767			.0683	.0289	.0260						

Cont....

TABLE 36 - cont.

	Program Elements										CWF TOTAL
	KGTN CORE	1-2 CORE	3-5 CORE	ELEM. FR	MUSIC	LIB.	INT. CORE	INT. FRENCH	IA	HE	
III. GRADES 3-5											
10. portion C			.8642	.0741	.0247	.0370					
11. element CW			1.0	.07794	.0330	.0444					1.1554
12. CW/total			.8655	.0675	.0286	.0385					
IV. INTERMEDIATE											
10. portion C					.0167	.0333	.7555	.1111	.05	.0333	
11. element CW					.0223	.0400	1.0813	.1192	.1473	.1026	1.5127
12. CW/total					.0147	.0264	.7148	.0788	.0974	.0678	

* Half of the time is contributed by specialists, $M = 1.3$; the other half by class teachers, $M = 1.2$.

a. From Table 11. b. $W = M(1+P)$.

SCHOOL E (TABLES 37-42)

September, 1973, was the last time regular program kindergarten children were enrolled in School E, which will become an immersion only school when that cohort finishes grade 6. In 1973 the school had 423 students enrolled in grades K to 6 of the regular program and 217 students enrolled in immersion grades K to 3. In 1976, there were only 122 students enrolled in grades 3 to 6 of the regular program and 422 enrolled in grades K to 6 of the immersion program.

Although most of the discussion of School E will focus on the immersion program, the use of a half-time teaching vice principal at this school is interesting. In 1973, the school divided the grade 5 and 6 students into six classes in the mornings and into five classes in the afternoons. Language arts and mathematics were taught to the smaller morning classes (as was basic French), and the larger afternoon classes took music (three weeks out of four taught by a specialist with the class teacher present) and environmental studies using a curriculum which emphasized projects and extensive use of the library. The vice principal was assigned to teach one of the six morning classes, and was free to assume administrative duties in the afternoon when his students merged with the other five classes. In 1976 the vice principal's teaching duties were remediation in English for both regular and immersion students and he had no regular class assignments. This pattern was similar to the organization of School B grade 4 to 6 regular program in 1973, although there the vice principal's 'remediation' was integrated into the regular reading program of the classes, and the cost charged to these classes. In School E the remediation is not costed against programs.

In 1976 the regular program includes 30 minutes per week of library and of music and 30 minutes per day of basic French (more than the 20

minutes per day usual for this board). The remainder of the program is taught by the regular class teacher.

The English language arts given to immersion students affects classes unevenly so that grades 2 to 5 have an hour (or more) a day while kindergarten and grade 1 have none. In 1973, when grade 3 was the leading edge of the program, there were 850 minutes per cycle during which the English teacher took over grade 2 and 3 immersion classes. The resulting p-and-p time was shared by all seven immersion teachers by having the grade 2 and 3 teachers spend some of their class English time relieving the teachers of kindergarten and grade 1. In this way the p-and-p time of immersion teachers was evened out and was only 30 minutes per week more than that of regular program teachers of these grades.

In 1976, the nine grade 2 to 5 classes received a total of 3150 minutes per week of English language instruction (including mathematics presented in English to grade 5). These teachers spent 750 minutes teaching basic French to the five regular classes and 240 minutes teaching physical education and music to grade 1 students. These assignments still left very uneven allotments of p-and-p time, from 375 minutes for one immersion grade 4 teacher down to 30 minutes for the kindergarten teachers and 60 minutes for the grade 5/6 and 6 immersion teachers. Further equalization took place by assigning teachers with more planning time to give more yard duty. Teachers with 165 minutes per week or less of p-and-p time had no yard duty. Teachers with more p-and-p time were assigned more yard duty, up to 14 times (about 210 minutes) per week. However, all p-and-p time was costed to the programs taught by the teachers who had it, which accounts for the higher cost of the immersion grade 2, 3 and 4 programs (IV, V, VI). It should be noted that as the regular program is phased out of the school the basic French assignments will cease, making utilization of time freed by English to immersion more difficult.

TABLE 37

SCHOOL E, 1973: CLASS TIME ALLOCATION (min. per 5-day cycle)

PROG	CLASS	Z	KGTN CORE	1-4 CORE	5-6 AM CORE	5-6 PM CORE	KGTN IMM	1-3 IMM	BASIC FR	ENG	1-4 MUSIC	5/6 MUSIC	LIB	TOTAL
I	RK	25	547.5						100		22.5		30	700
	Portion C		.7821						.1429		.0321		.0429	
II	R1	30		1247.5					100		22.5		30	1400
	R2	32		1247.5					100		22.5		30	1400
	R2/3	33		1247.5					100		22.5		30	1400
	R3	33		1247.5					100		22.5		30	1400
	Portion C			.8911					.0714		.0160		.0214	
III	R4a	28		1277.5					100		22.5			1400
	R4b	28		1277.5					100		22.5			1400
	R4/5	30		1277.5					100		22.5			1400
	Portion C			.9125					.0714		.0161			
IV	R5a	34			600	677.5			100			22.5		1400
	R5b	33			600	677.5			100			22.5		1400
	R5/6	26			600	677.5			100			22.5		1400
	R6a	29			600	677.5			100			22.5		1400
	R6b	31			600	677.5			100			22.5		1400
	R6c	31			600	677.5			100			22.5		1400
	Portion C				.4286	.4839			.0714		.0161			
V	IKa	26					647.5				22.5		30	700
	IKb	27					647.5				22.5		30	700
	IKc	24					647.5				22.5		30	700
	IKd	24					647.5				22.5		30	700
	Portion C						.9250				.0321		.0429	

Cont....

-143-

TABLE 37 - cont.

PROG	CLASS	Z	KGTV CORE	1-4 CORE	5-6 AM CORE	5-6 PM CORE	KGTV IMM	1-3 IMM	BASIC FR	ENG	1-4 MUSIC	5/6 MUSIC	LIB	TOTAL
VI	Ila	24						1347.5			22.5		30	1400
	Ilb	25						1347.5			22.5		30	1400
	Portion C							.9625			.0161		.0214	
VII	I2	21						1097.5		250	22.5		30	1400
	Portion C							.7839		.1786	.0161		.0214	
VIII	I2/3	21						1047.5		300	22.5		30	1400
	I3	25						1047.5		300	22.5		30	1400
	Portion C							.7482		.2143	.0161		.0214	
TOTAL 640			547.5	8822.5	3600	4065	2590	5887.5	1400	850	382.5	135	420	28700

Average class size 27.8

TABLE 38

SCHOOL E, 1973: TEACHER TIME ALLOCATION (min. per cycle)

N	TEACH	TOTAL TIME	SAL. RATIO	P-P TIME	Program Elements											Milieu	
					KG TN CORE	1-4 (4/5) CORE	5-6 A.M. CORE	5-6 P.M. CORE	KG TN IMM.	1-3 IMM.	BASIC FR	ENG.	1-4 MUSIC	5/6 MUSIC	LIB	PCR	ADMIN
1	K	700	1.1	130	547.5 130								22.5				
1	CLASS 1-3	1400	1.0	130		1247.5 130							22.5				
3	CLASS 1-3	4200	1.0	390		3742.5 390							67.5				
1	CLASS 4	1400	1.0	100		1277.5 100							22.5				
2	CLASS 4(4/5)	2800	1.0	200		2555.0 200							45.0				
1	CLASS 5-6	1400	1.0	100			600 47	677.5 53						22.5			
4	CLASS 5-6	5600	1.0	400			2400 188	2710.0 212						90.0			
1	FI K	1400	1.1	160					1195 160				45.0				
1	FI K	1400	1.1	160					1195 160				45.0				

TABLE 38 - cont. 1

					Program Elements											Milieu	
N	TEACH	TOTAL TIME	SAL. RATIO	P-P TIME	KG TN CORE	1-4 (4/5) CORE	5-6 A.M. CORE	5-6 P.M. CORE	KG TN IMM.	1-3 IMM.	BASIC FR	ENG.	1-4 MUSIC	5/6 MUSIC	LIB	PCR	ADMIN
1	CLASS FI 1-2	1400	1.0	160						1217.5 160			22.5				
2	CLASS FI 1-2	2800	1.0	320						2435.0 320			45.0				
1	FI 2/3	1400	1.0	160					100	1117.5 160			22.5				
1	FI3	1400	1.0	160					100	1117.5 160			22.5				
1	VP	1400	1.4	100			600 100										700
1	LIB	1400	1.2												420	980	
1	FR A	1400	1.0	500							900 500						
1	FR B	700	1.0	200							500 200						
1	ENG	1050	1.0	200								850 200					
1	MUSIC	495	1.1										382.5	112.5			
cont....																	

cont....

-146-

TABLE 38 - cont. 2

					Program Elements										Milieu		
N	TEACH	TOTAL TIME	SAL. RATIO	P-P TIME	KGTN CORE	1-4 (4/5) CORE	5-6 A.M. CORE	5-6 P.M. CORE	KGTN IMM.	1-3 IMM.	BASIC FR.	ENG.	1-4 MUSIC	5/6 MUSIC	LIB	PCR	ADMIN
1	REM	700	1.2													700	
1	PRIN	1400	1.75														1400
INST TIME 28,495					547.5	8822.5	3600	3387.5	2590	5887.5	1400	850	765	225	420		
P-P TIME 3570					130	820	335	265	320	800	700	200	--	--	--		
TOTAL TIME 35,845					677.5	9642.5	3935	3652.5	2910	6687.5	2100	1050	765	225	420	1680	2100

-147-

TABLE 39

SCHOOL E, 1973: PROGRAM COST FACTORS

Description	KGTN CORE	1-4 CORE	5-6AM CORE	5-6PM CORE	KGTN IMM	1-3 IMM	BASIC FR	ENG	1-4 MUS	5/6 MUS	LIB	CWF TOTAL
1. Class time Tc Teacher time	547.5	8822.5	3600	4065	2590	5887.5	1400	850	382.5	135	420	
2. Instruction Ti	547.5	8822.5	3600	3387.5	2590	5887.5	1400	850	765	225	420	
3. P-P time Tp	130	820	335	265	320	800	700	200	--	--	--	
4. Total time Tt	677.5	9642.5	3935	3652.5	2910	6687.5	2100	1050	765	225	420	
5. Ti/Tc = I	1.0	1.0	1.0	.8332	1.0	1.0	1.0	1.0	2.0	1.6667	1.0	
6. Tp/Tc = P	.2374	.0929	.0931	.0652	.1236	.1359	.5	.2353	--	--	--	
7. I + P	1.2374	1.0929	1.0931	.8984	1.1236	1.1359	1.5	1.2353	2.0	1.6667	1.0	
8. Salary ratio M ^a	1.1	1.0	1.0	1.0	1.1	1.0	1.0	1.0	1.05*	1.05*	1.2	
9. Weight factor W ^b	1.3612	1.0929	.0931	.8984	1.2359	1.1359	1.5	1.2353	2.1	1.7500	1.2	
I. KINDERGARTEN												
10. Portion C	.7821						.1429		.0321		.0429	
11. Element CW	1.0646						.2143		.0675		.0514	1.3979
12. CW/Total	.7616						.1533		.0483		.0368	
II. GRADES 103												
10. Portion C		.8911					.0714		.0161		.0214	
11. Element CW		.9739					.1071		.0337		.0257	1.1405
12. CW/Total		.8539					.0939		.0296		.0225	
III. GRADES 4, 4/5												
10. Portion C		.9125					.0714		.0161			
11. Element CW		.9973					.1071		.0337			1.1382
12. CW/Total		.8762					.0941		.0297			

cont....

TABLE 39 - cont.

DESCRIPTION	KG TN CORE	1-4 CORE	5-6AM CORE	5-6PM CORE	KG TN IMM	1-3 IMM	BASIC FR	ENG	1-4 MUS	5/6 MUS	LIB	CWF TOTAL
IV. GRADES 5-6												
10. Portion C			.4286	.4839			.0714			.0161		
11. Element CW			.4685	.4348			.1071			.0281		1.0385
12. CW/Total			.4511	.4187			.1032			.0271		
V. FI KINDERGARTEN												
10. Portion C					.925				.0321		.0429	
11. Element CW					1.1432				.0675		.0514	1.2621
12. CW/Total					.9294				.0287		.0418	
VI. FI GRADE 1												
10. Portion C						.9625			.0161		.0214	
11. Element CW						1.0933			.0337		.0257	1.1527
12. CW/Total						.9618			.0156		.0226	
VII. FI GRADE 2												
10. Portion C						.7839		.1786	.0161		.0214	
11. Element CW						.8905		.2206	.0337		.0257	1.1705
12. CW/Total						.7713		.1911	.0153		.0223	
VIII. FI GRADE 3												
10. Portion C						.7482		.2143	.0161		.0214	
11. Element CW						.8499		.2647	.0337		.0257	1.1740
12. CW/Total						.7339		.2286	.0153		.0222	

* Average of participating staff.

a. From Table 11.

b. $W = M(I + P)$

-149-

TABLE 40

SCHOOL E, 1976: CLASS TIME ALLOTMENT (min. per 5-day cycle)

PROG	CLASS	Z	KGTN CORE	1 IMM CORE	2-3 I CORE	4 IMM CORE	5 IMM CORE	6 IF CORE	6 IE CORE	3-6R CORE	LIB	MUS	PE	ENG	ENG/ MATH	BASIC FR	TOTAL
I	IKa	20	645								30						675
	IKb	21	645								30						675
	portion C		.9555								.0444						
II	IKa	19	675														675
	IKb	20	675														
	portion C		1.0														
III	Ila	22		1275							30	60	60				1425
	Ilb	27		1275							30	60	60				1425
	Ilc	26		1275							30	60	60				1425
	portion C			.8947							.0210	.0421	.0421				
IV	I2a	24			1095						30			300			1425
	I2b	25			1095						30			300			1425
	I2c	25			1095						30			300			1425
	portion C				.7684						.0210			.2105			
V	I3a	23			1065						30	30		300			1425
	I3b	22			1065						30	30		300			1425
	I3c	21			1065						30	30		300			1425
	portion C				.7474						.0210	.0210		.2105			
VI	I4a	25				990					30	30		375			1425
	I4b	27				990					30	30		375			1425
	portion C					.6947					.0210	.0210		.2632			
VII	I5	25					765				30	30			600		1425
	portion C						.5368				.0210	.0210			.4211		

cont...

TABLE 40 - cont.

PROG	CLASS	Z	KCTN CORE	1 IMM CORE	2-3 I CORE	4 IMM CORE	5 IMM CORE	6 IF CORE	6 IE CORE	3-6R CORE	LIB	MUS	PE	ENG	ENG/ MATH	BASIC FR	TOTAL
VIII	I5/6	24						645	720		30	30					1425
	I6	26						720	645		30	30					1425
	portion C							.5053	.4526		.0210	.0210					
IX	R3	24								1215	30	30				150	1425
	R4	19								1215	30	30				150	1425
	R5	26								1215	30	30				150	1425
	R5/6	27								1215	30	30				150	1425
	R6	26								1215	30	30				150	1425
	portion C									.8526	.0210	.0210				.1053	
TOTAL		544	2640	3825	6480	1980	765	1365	1365	6075	630	570	180	2550	600	750	29775

Average class size 23.6

TABLE 41

SCHOOL E, 1976: TEACHER TIME ALLOCATION (min. per cycle)

N	TEACHER	TOTAL TIME	SAL RATIO	P-P TIME	Program Elements														Milieu	
					KG TN CORE	1 IMM CORE	2-3 I CORE	4 IMM CORE	5 IMM CORE	6 IF CORE	6 IE CORE	3-6 R CORE	LIB	MUS	PE	ENG	ENG/ MATH	BASIC FR	PCR	ADMIN
	FKa	1350	1.1	30	1320 30															
	FKb	1350	1.1	30	1320 30															
1	F1a	1425	1.0	150		1275 150														
2	F1b,c	2850	1.0	300		2550 300														
	F2a	1425	1.0	180			1095 180												150	
	F2b	1425	1.0	180			1095 180												150	
	F2c	1425	1.0	270			1095 256								60 14					
	F3a	1425	1.0	210			1065 184											150 26		
	F3b	1425	1.0	300			1065 284								60 16					
	F3c	1425	1.0	300			1065 284							60 16						

cont...

TABLE 41 - cont.

N	TEACHER	TOTAL TIME	SAL RATIO	P-P TIME	Program Elements														Milieu	
					KG TN CORE	1 IMM CORE	2-3 I CORE	4 IMM CORE	5 IMM CORE	6 IF CORE	6 IE CORE	3-6 R CORE	LIB	MUS	PE	ENG	ENG/ MATH	BASIC FR	PCR	ADMIN
	F4a	1425	1.0	375				990 354							60 21					
	F4b	1425	1.0	285				990 248										150 37		
	F5	1425	1.0	210					765 132									450 78		
	E5/6	1425	1.0	60								1365 60								
	F6	1425	1.0	60						1365 60										
	ENGa	1425	1.0	75												750 42	600 33			
	ENGb	1425	1.0	225												1200 225				
	ENGc	675	1.0	75												600 75				
	FRem	750	1.2	-															750	
1	E3-6a	1425	1.0	210								1215 210								
4	E3-6b,c	5700	1.0	840								4860 840								

cont....

TABLE 41 - cont.

N	TEACHER	TOTAL TIME	SAL RATIO	P-P TIME	Program Elements												Milieu		
					KG TN CORE	1 IMM CORE	2-3 I CORE	4 IMM CORE	5 IMM CORE	6 IF CORE	6 IE CORE	3-6 R CORE	LIB	MUS	PE	ENG	ENG/ MATH	BASIC FR	PCR
	LIB	750	1.2	-									630					120	
	MUS	675	1.1	165										510 165					
	VP-REM	1425	1.3	-														750	675
	PRIN	1425	1.75	-															1425
INSTRUCTION 29775					2640	3825	6480	1980	765	1365	1365	6075	630	570	180	2550	600	750	
P-P 4530					60	450	1368	602	132	60	60	1050	-	181	51	342	33	141	
TOTAL TIME 38325					2700	4275	7848	2582	897	1425	1425	7125	630	751	231	2892	633	891	1920 2100

TABLE 42

SCHOOL E, 1976: PROGRAM COST FACTORS

	KGTN CORE	1 IMM CORE	2-3 I CORE	4 IMM CORE	5 IMM CORE	6 IF CORE	6 IE CORE	3-6 R CORE	LIB	MUS	PE	ENG	ENG/ MATH	BASIC FR	CWF TOTAL
1. Class time Tc	2640	3825	6480	1980	765	1365	1365	6075	630	570	180	2550	600	750	
Teacher time															
2. Instruction Ti	2640	3825	6480	1980	765	1365	1365	6075	630	570	180	2550	600	750	
3. P-P Tp	60	450	1368	602	132	60	60	1050	--	181	51	342	33	141	
4. Total Tt	2700	4275	7848	2582	897	1425	1425	7125	630	751	231	2892	633	891	
5. Ti/Tc = I	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
6. Tp/Tc = P	.0227	.1176	.2111	.3040	.1725	.0440	.0440	.1728	-	.3175	.2833	.1341	.055	.188	
7. I + P	1.0227	1.1176	1.2111	1.3040	1.1725	1.0440	1.0440	1.1728	1.0	1.3175	1.2833	1.1341	1.055	1.188	
8. Salary ratio M ^a	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.1	1.0	1.0	1.0	1.0	
9. Weight factor W ^b	1.1250	1.1176	1.2111	1.3040	1.1725	1.0440	1.0440	1.1728	1.2	1.4493	1.2833	1.1341	1.055	1.188	
I. KINDERGARTEN A.M.															
10. Portion C	.9555								.0444						
11. Element CW	1.0750								.0533						1.1283
12. CW/Total	.9528								.0472						
II. KINDERGARTEN P.M.															
10. Portion C	1.0														
11. Element CW	1.1250														1.1250
12. CW/Total	1.0														
III. IMM. GRADE 1															
10. Portion C		.8947							.0210	.0421	.0421				
11. Element CW		1.0000							.0253	.0610	.0540				1.1403
12. CW/Total		.8769							.0222	.0535	.0474				
															cont....

-155-

TABLE 42 - cont.

	KGTN CORE	1 IMM CORE	2-3 I CORE	4 IMM CORE	5 IMM CORE	6 IF CORE	6 IE CORE	3-6 R CORE	LIB	MUS	PE	ENG	ENG/ MATH	BASIC FR	CWF TOTAL
IV. IMM. GRADE 2															
10. Portion C			.7684						.0210			.2105			
11. Element CW			.9306						.0253			.2388			1.1947
12. CW/Total			.7790						.0212			.1999			
V. IMM. GRADE 3															
10. Portion C			.7474						.0210	.0210		.2105			
11. Element CW			.9051						.0253	.0305		.2388			1.1997
12. CW/Total			.7544						.0211	.0254		.1991			
VI. IMM. GRADE 4															
10. Portion C				.6947					.0210	.0210		.2632			
11. Element CW				.9060					.0253	.0305		.2985			1.2602
12. CW/Total				.7189					.0201	.0242		.2089			
VII. IMM. GRADE 5															
10. Portion C					.5368				.0210	.0210		.4211			
11. Element CW					.6295				.0253	.0305		.4442			1.1295
12. CW/Total					.5573				.0224	.0270		.3933			
VIII. IMM. GRADE 6															
10. Portion C						.5053	.4526		.0210	.0210					
11. Element CW						.5275	.4725		.0253	.0305					1.0558
12. CW/Total						.4996	.4475		.0240	.0290					
IX. REG. GRADES 3-6															
10. Portion C								.8526	.0210	.0210				.1053	
11. Element CW								1.0000	.0253	.0305				.1250	1.1808
12. CW/Total								.8469	.0214	.0258				.1059	

a. From Table 11.

b. $W = M(I+P)$.

SCHOOL F (TABLES 8-10; 43-45)

School F was a middle school with a rotary system organized by 'houses' in both 1973 and 1976. The size of the school and its rotary system allowed diverse subjects to be offered. In 1973 the 749 students were organized into six houses of four classes each. Two programs were offered, one for grade 6 students with industrial arts and home economics offered to half-size classes, and one for grade 7/8 students which included theatre arts as part of a unified arts program offered to four-fifth sized classes. An options program was offered the last four periods of every cycle. In 1976 the 670 (almost 80 fewer) students were organized into five houses with either three or four classes each. The grade 6, 7 and 8 programs were the same, except for one grade 6 class which takes environmental studies in French. The arrangements for this extended program were easy to schedule in School F because the French teachers were integrated into the teaching teams for every house and teach subjects in English in addition to basic French.

At both times united arts includes industrial arts, home economics, art, music and theatre arts. In 1973 one class from each of the four houses took UA at a time (since there were only three house teachers one class had to be away from home throughout the day), with students re-forming into five classes which took each of the five arts in rotation over the year. In 1976 all the classes from a house take UA at the same time and this provides a group planning period for the house teaching team.

The cost of programs, comparing the 1973 7-8 program with 1976 6, 7, 8 program (II), has risen mainly because of the higher ratio of teacher instruction time to class instruction time, resulting from the addition of extra teachers to help with house subjects and the three-class houses taking united arts. The ratio of p-and-p to class instruction time has remained relatively constant, although higher for this middle school than for elementary schools. It should also be noted that the class size has increased, so that the ratio of total teacher time to *student* time has decreased even though teacher to *class* time has increased.

TABLE 43

SCHOOL F, 1976: CLASS TIME ALLOTMENT (min. per 2-day cycle)

PROG	CLASS	Z	BASIC FR	EXT FR	6-8 CORE	PE	UA	TOTAL
I	6a	36	80	100	320	40	60	600
	portion C		.1333	.1667	.5333	.0667	.10	
II	6b	37	80		420	40	60	600
	6c	40	80		420	40	60	600
	6d	41	80		420	40	60	600
	7a	34	80		420	40	60	600
	7b	36	80		420	40	60	600
	7c	38	80		420	40	60	600
	7d	37	80		420	40	60	600
	7e	38	80		420	40	60	600
	7f	39	80		420	40	60	600
	7g	37	80		420	40	60	600
	8a	37	80		420	40	60	600
	8b	36	80		420	40	60	600
	8c	35	80		420	40	60	600
	8d	37	80		420	40	60	600
	8e	36	80		420	40	60	600
	8f	38	80		420	40	60	600
	8g	38	80		420	40	60	600
	portion C		.1333		.7000	.0667	.10	
TOTAL		670	1440	100	7460	720	1080	10800

Average class size 37.2

TABLE 44

SCHOOL F, 1976: TEACHER TIME ALLOTMENT (min. per cycle)

N	TEACH	TOTAL TIME	SAL RATIO	P-P TIME	Program Elements					Milieu	
					BASIC FR	EXT FR	CORE	PE	UA	PCR	ADMIN
1	Fa	600	1.0	100	320 64	100 20	80 16				
	Ea	600	1.2	100			500 100				
11	Eb	6600	1.2	1100			5500 1100				
	Fb	600	1.0	100	320 64		180 36				
	Fc	600	1.0	100	320 64		180 36				
	Fd	600	1.0	100	240 48		260 52				
	Fe	600	1.0	100	240 48		260 52				
	PE	600	1.05	60			180 20	360 40			
	PE	600	1.05	60			180 20	360 40			
	MUS	600	1.1	100			200 40		300 60		

cont...

TABLE 44 - cont.

N	TEACH	TOTAL TIME	SAL RATIO	P-P TIME	Program Elements					Milieu	
					BASIC FR	EXT FR	CORE	PE	UA	PCR	ADMIN
	Th Art	600	1.2	100			200 40		300 60		
	IA	600	1.3	100			200 40		300 60		
	HE	600	1.3	100			200 40		300 60		
	Art	600	1.1	100			200 40		300 60		
	Guid	600	1.1	-						600	
	Lib	600	1.2	-						600	
	SPE	600	1.2	-						600	
	VP	600	1.4	-							600
	PRIN	600	1.75	-							600
INSTRUCTION P-P		12,800		2320	1440 288	100 20	8320 1632	720 80	1500 300		
TOTAL		17,400			1728	120	9952	800	1800	1800	1200

TABLE 45

SCHOOL F, 1976: PROGRAM COST FACTORS

		BASIC FR	EXT FR	6-8 CORE	PE	UA	CWF TOTAL
1. Class time	Tc	1440	100	7460	720	1080	
Teacher time							
2. Instruction	Ti	1440	100	8320	720	1500	
3. P-P	Tp	288	20	1632	80	300	
4. Total	Tt	1728	120	9952	800	1800	
5. Ti/Tc = I		1.0	1.0	1.1153	1.0	1.3889	
6. Tp/Tc = P		.2	.2	.2176	.111	.2778	
7. I + P		1.2	1.2	1.3340	1.1111	1.6667	
8. Sal. ratio	M ^a	1.0	1.2	1.2	1.05	1.2*	
9. Weight factor	W ^b	1.2	1.44	1.6009	1.1667	2.0	
I. EXTENDED GRADE 6							
10. Portion C		.1333	.1667	.5333	.0667	.1000	
11. Element CW		.1600	.2400	.8538	.0778	.2000	1.5316
12. CW/Total		.1045	.1567	.5575	.0508	.1306	
II. REG. GRADES 6-8							
10. Portion C		.1333		.7000	.0667	.1000	
11. Element CW		.1600		1.1206	.0778	.2000	1.5584
12. CW/Total		.1027		.7191	.0499	.1283	

* Average of participating teachers.

a. From Table 11.

b. $W = M(I + P)$.

SCHOOL H (TABLES 46-51)

Like many other schools in the system, School H was affected by a drop in enrolment from 1973 to 1976. Its 1976 enrolment of 422 was more than 90 students under the 1973 figure and two classes were eliminated. There have also been changes in program. Options were discontinued, the special music was no longer given, library periods were no longer formally scheduled, and the 40 minutes per day basic French program reached grade 6.

In terms of teacher scheduling, the costs of junior and senior kindergarten have been evened out by having the senior kindergarten teacher give time to the junior kindergarten so its teacher can have planning time. In the grades, the extension of the 40-minute French program, and the acceptance of this time as teacher p-and-p time (rather than using it for remediation as was done in 1973) have increased program costs. It should be noted as well that the ratio of pupil contact resource teacher time (including library and remediation) has increased slightly from .083 to .109 to 1.

TABLE 46

SCHOOL H, 1973: CLASS TIME ALLOCATION (min. per 5-day cycle)

PROG	CLASS	Z	J KGTN CORE	S KGTN CORE	1-2 CORE	3-6 CORE	BASIC FR	OPT	K-2 LIB	3-6 LIB	TOTAL TIME
I	JKa	na	695						30		725
	JKb	22	695						30		725
	JKc	20	695						30		725
	Portion C		.9586						.0414		
II	KPa	19		545			150		30		725
	KPb	21		545			150		30		725
	KPc	23		545			150		30		725
	Portion C			.7517			.2069		.0414		
III	1a	29			1145		200	75	30		1450
	1b	30			1145		200	75	30		1450
	2a	33			1145		200	75	30		1450
	2b	33			1145		200	75	30		1450
	Portion C				.7897		.1379	.0517	.0207		
V	3a	30				1245	100	75		30	1450
	3b	29				1245	100	75		30	1450
	4a	28				1245	100	75		30	1450
	4b	28				1245	100	75		30	1450
	5a	28				1245	100	75		30	1450
	5b	31				1245	100	75		30	1450
	3-4-5	30				1245	100	75		30	1450
	6a	31				1245	100	75		30	1450
	6b	31				1245	100	75		30	1450
	Portion C					.8586	.0690	.0517		.0207	
TOT. CLASS TIME 496			2085	1635	4580	11205	2150	975	300	270	23200

Average class size 27.6

TABLE 47

SCHOOL H, 1973: TEACHER TIME ALLOCATION (min. per cycle)

N	TEACH	TOTAL TIME	SAL RATIO	P-P TIME	Program Elements								Milieu	
					J KGTN CORE	S KGTN CORE	1-2 CORE	3-6 CORE	BASIC FR	OPT	K-2 LIB	3-6 LIB	PCR	ADMIN
1	KGTN	1450	1.1	NONE	1390							60		
1	KGTN 2	1450	1.1	150	695 75	545 75						60		
1	KGTN 3	1450	1.1	300		1090 300						60		
1	CLASS 1-2	1450	1.0	100			1145 100			75		30	100	
3	CLASS 1-2	4350	1.0	300			3435 300			225		90	300	
1	CLASS 3-6	1450	1.0	130				1245 130		75				
8	CLASS 3-6	11600	1.0	1040				9960 1040		600				
1	FRa	1450	1.0	325					1050 325	75				
1	FRb	1450	1.0	275					1100 275	75				
1	LIB	1450	1.2							75	300	270	805	
cont....														

TABLE 47 - cont.

N	TEACH	TOTAL TIME	SAL RATIO	P-P TIME	Program Elements								Milieu	
					J KG CORE	TN S KG CORE	1-2 CORE	3-6 CORE	BASIC FR	OPT	K-2 LIB	3-6 LIB	PCR	ADMIN
1	REM	725	1.2										725	
1	PRIN	1450	1.75							75				1375
INST TIME					2085	1635	4580	11205	2150	1275	600	270		
P-P TIME					75	375	400	1170	600	--	--	--		
TOTAL TIME					2160	2010	4980	12375	2750	1275	600	270	1930	1375

TABLE 48

SCHOOL H, 1973: PROGRAM COST FACTORS

DESCRIPTION	J KG TN CORE	S KG TN CORE	1-2 CORE	3-6 CORE	BASIC FR	OPT	K-2 LIB	3-6 LIB	CWF TOTAL
1. Class time Tc	2085	1635	4580	11205	2150	975	300	270	
Teacher time									
2. Instruction Ti	2085	1635	4580	11205	2150	1275	600	270	
3. P-P Tp	75	375	400	1170	600	--	--	--	
4. Total Tt	2160	2010	4980	12375	2750	1275	600	270	
5. Ti/Tc = I	1.0	1.0	1.0	1.0	1.0	1.3077	2.0	1.0	
6. Tp/Tc = P	.0360	.2294	.0873	.1044	.2791	--	--	--	
7. I + P	1.0360	1.2294	1.0873	1.1044	1.2791	1.3077	2.0	1.0	
8. Salary ratio M ^a	1.1	1.1	1.0	1.0	1.0	1.09*	1.2	1.2	
9. Weight factor W ^b	1.1396	1.3523	1.0873	1.1044	1.2791	1.4254	2.4	1.2	
I. JR. KG TN									
10. Portion C	.9586						.0414		
11. Element CW	1.0924						.0993		1.1917
12. CW/Total	.9167						.0833		
II. SR. KG TN									
10. Portion C		.7517			.2069		.0414		
11. Element CW		1.0166			.2646		.0993		1.3805
12. CW/Total		.7364			.1917		.0719		
III. GRADES 1-2									
10. Portion C			.7897		.1379	.0517	.0207		
11. Element CW			.8586		.1764	.0737	.0497		1.1584
12. CW/Total			.7412		.1523	.0636	.0429		
IV. GRADES 3-6									
10. Portion C				.8586	.0690	.0517		.0207	
11. Element CW				.9483	.0882	.0737		.0248	1.1350
12. CW/Total				.8355	.0777	.0650		.0219	

* Average of participating teachers.

a. From Table 11.

b. $W = M(I + P)$.

TABLE 49

SCHOOL H, 1976: CLASS TIME ALLOCATION (min. per 5-day cycle)

PROG	CLASS	Z	KGTN JR AM	KGTN JR PM	KGTN SR AM	KGTN SR PM	1-2 CORE	3-6 CORE	BASIC FR	MUS	TOTAL	
I	JR Ka	22	775								775	
	Portion C		1.0									
II	Jr Kb	19		650							650	
	Jr Kc	21		650							650	
	Portion C			1.0								
III	Sr Ka	16			625				150		775	
	Sr Kb	21			625				150		775	
	Portion C				.8064				.1935			
IV	Sr Kc	17				500			150		650	
	Portion C					.7692			.2308			
V	1a	26					1195		200	30	1425	
	1b	26					1195		200	30	1425	
	2a	25					1195		200	30	1425	
	2b	23					1195		200	30	1425	
	Portion C						.8386		.1403	.0210		
VI	3a	28						1225	200		1425	
	3b	28						1225	200		1425	
	4	31						1225	200		1425	
	4/5	31						1225	200		1425	
	5	32						1225	200		1425	
	6a	28						1225	200		1425	
	6b	28						1225	200		1425	
	Portion C							.8596	.1403			
TOTAL CLASS TIME			422	775	1300	1250	500	4780	8575	2650	120	19950

Average class size 24.8

TABLE 50

SCHOOL H, 1976: TEACHER TIME ALLOCATION (min. per cycle)

N	TEACHER	TOTAL TIME	SAL RATIO	P-P TIME	Program Elements								Milieu	
					KG TN JR AM	KG TN JR PM	KG TN SR AM	KG TN SR PM	1-2 CORE	3-6 CORE	BASIC FR	MUS	PCR	ADMIN
	KA	1425	1.1	150	625 74	650 76								
	KB	1425	1.1	150		650 76	625 74							
	KC	1425	1.1	150	150 18		625 74	500 58						
1	1-2 class	1425	1.0	200					1195 200			30		
3	1-2 class	4275	1.0	600					3585 600			90		
1	3-6 class	1425	1.0	200						1225 200				
6	3-6 class	8550	1.0	1200						7350 1200				
	FR a	1425	1.0	175							1250 175			
	FR b	1425	1.0	225							1200 225			
	FR c	355	1.0	155*							200 155			

cont...

-169-

TABLE 50 - cont.

N	TEACHER	TOTAL TIME	SAL RATIO	P-P TIME	Program Elements								Milieu	
					KG TN JR AM	KG TN JR PM	KG TN SR AM	KG TN SR PM	1-2 CORE	3-6 CORE	BASIC FR	MUS	PCR	ADMIN
	LIB	1425	1.2	--									1425	
	PRIN	1425	1.75	--										1425
	REM	750	1.2	--									750	
	MUS	120	1.1	--								120		
	INSTRUCTION	20,070			775	1300	1250	500	4780	8575	2650	240		
	P-P			3205	92	152	148	58	800	1400	555	-		
	TOTAL	26,875			867	1452	1398	558	5580	9975	3205	240	2175	1425

* Includes travel time between schools.

TABLE 51

SCHOOL H, 1976: PROGRAM COST FACTORS

DESCRIPTION	KGTN JR AM	KGTN JR PM	KGTN SR AM	KGTN SR PM	1-2 CORE	3-6 CORE	BASIC FR	MUS	CWF TOTAL
1. Class time Tc	775	1300	1250	500	4780	8575	2650	120	
Teacher time									
2. Instruction Ti	775	1300	1250	500	4780	8575	2650	240	
3. P-P Tp	92	152	148	58	800	1400	555	-	
4. Total Tt	867	1452	1398	558	5580	9975	3205	240	
5. Ti/Tc = I	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	
6. Tp/Tc = P	.1187	.1169	.1184	.116	.1674	.1633	.2094	-	
7. I + P	1.1187	1.1169	1.1184	1.116	1.1674	1.1633	1.2094	2.0	
8. Salary ratio M ^a	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.1	
9. Weight Factor W ^b	1.2306	1.2286	1.2302	1.2276	1.1674	1.1633	1.2094	2.2	
I. JR KGTN									
10. Portion C	1.0								
11. Element CW	1.2306								1.2306
12. CW/Total	1.0								
II. JR KGTN									
10. Portion C		1.0							
11. Element CW		1.2286							1.2286
12. CW/Total		1.0							
III. SR. KGTN									
10. Portion C			.8064				.1935		
11. Element CW			.9921				.2341		1.2262
12. CW/Total			.8091				.1909		

cont....

-171-

TABLE 51 - cont.

DESCRIPTION	KG TN JR AM	KG TN JR PM	KG TN SR AM	KG TN SR PM	1-2 CORE	3-6 CORE	BASIC FR	MUS	CWF TOTAL
IV. SR KG TN									
10. Portion C				.7692			.2308		
11. Element CW				.9443			.2791		1.2234
12. CW/Total				.7719			.2281		
V. GRADES 1-2									
10. Portion C					.8386		.1403	.0210	
11. Element CW					.9789		.1697	.0463	1.1950
12. CW/Total					.8192		.1420	.0387	
VI. GRADES 3-6									
10. Portion C						.8596	.1403		
11. Element CW						1.0000	.1697		1.1697
12. CW/Total						.8548	.1451		

a. From Table 11.

b. $W = M(I + P)$.

DISCUSSION

In general, there have been increases in teacher time spent on planning for program in all schools in the study except one (D) which had the highest T_p/T_c rate in 1973. The increase tends to be accounted for primarily by the implementation of the 40-minute basic French programs and by the extension of immersion programs through the grades where an hour or more of English is offered. The ratio of planning time to class instruction time in the three schools with 40-minute basic French arose from around .1 to 1 to .15 to 1 (Table 52). In the immersion school without a 40-minute program the ratio rose from .124 to 1 to .152 to 1. Immersion teachers in this school teach basic French when their classes take English, which tends to reduce the p-and-p time total. However, in the only elementary school with neither immersion nor a 40-minute basic program, the amount of p-and-p time increased by nearly the same proportion as it did in the immersion school at its board.

There are two apparent reasons why the 40-minute program creates planning time for class teachers. First, except in schools on rotary, it is difficult to re-allocate this time to class teaching. In a questionnaire sent to principals in spring 1974, 45 per cent of respondents felt that 40 minutes was necessary or at least acceptable as planning time. Almost all other principals would use some (41 per cent) or all (12 per cent) of it for remediation or work with small groups of students (MacNab, 1975:6-7). Only 2 per cent felt that it could be used as class teaching time. Second, the teachers wanted this time for planning and the board accepted their demands as reasonable.

227

TABLE 52

TEACHER TIME ALLOTTED TO VARIOUS FUNCTIONS AS A PROPORTION OF CLASS INSTRUCTION TIME, SEVEN OTTAWA-CARLETON SCHOOLS, 1973 and 1976 *

School	Yr.	Instruction	P-P	Resource	Admin.	Total per class	Class size	FTR
A(K-6)	73	1.033	.10	.119	.093	1.345	28.4	21.1
	76	1.0	.125	.125	.083	1.333	29.75	22.3
B(K-6)	73	1.037	.094	.058	.077	1.266	27.0	21.3
	76	1.010	.148	.058	.090	1.306	24.9	19.0
C(K-6)	73	1.013	.111	.116	.160	.1400	25.5	18.2
	76	1.014	.152	.151	.088	1.405	22.5	16.0
D(K-8)	73	1.108	.263	.110	.094	1.575	29.5	18.7
	76	1.047	.161	.026	.117	1.351	33.9	25.1
E(K-6)	73	0.993	.124	.059	.073	1.249	27.8	22.2
	76	1.0	.152	.064	.071	1.287	23.6	18.3
F(6-8)	73	1.046	.202	.129	.082	1.459	31.2	21.4
	76	1.118	.215	.167	.111	1.611	37.2	23.1
H(K-6)	73	1.026	.113	.083	.059	1.281	27.6	21.5
	76	1.006	.161	.109	.071	1.347	24.8	18.4

*Ratios are figured using total class time for all programs or classes as base which is divided into the total teacher time for each function indicated by column heading. E.g., The Instruction ratio of 1.006 for School H in 1976 is obtained by dividing the total teacher instruction time (20,070 minutes from Table 50) by the total class instruction time (19,950 minutes from Table 49).

The immersion teacher is relieved by a specialist in English language arts for an hour (or more) a day, but this occurs only in grades 2 through 5. For one class at each grade from kindergarten through grade 5 the total English specialist time is only ten minutes a day more than the specialist time demanded by the 40-minute basic French, with 30 minutes in kindergarten. Furthermore, the grade 6 immersion program is a half-day with a French-speaking teacher and half with an English-speaking teacher. In one school (B) where there was only one grade 6 class, these teachers taught basic French and English to immersion in the other half of their day and received p-and-p time then. In the other school (E) where there were two 'grade 6' classes, these teachers received very little p-and-p time. Thus the K to 6 immersion program calls for somewhat less 'specialist' time overall than does the 40-minute basic French. Furthermore, the longer periods of English appear to make re-allocation of some of this time easier. It can be used to teach basic French, for example.

These allocations of planning time were associated with subjects in the program. Other p-and-p time allowances seemed to be associated with the number of classes a specialist was expected to cover in the time spent in the school. In School C in 1973 the basic French teacher had no time to plan in her half-day at the school. In 1976, she was in the school a longer time to cover the 40-minute periods, and had about a fifth of her time for planning (Tables 27 and 30, line 6). In School A on the other hand, the reverse occurred. The smaller number of classes fit the timetable better and less planning time was available, although it was still a higher proportion than for class teachers (Tables 15 and 18, line 6).

Another reason for higher program costs is the teaching of smaller groups of students for part of the program. Sometimes, as in the united arts program in School F, this was a policy based on the perceived needs of the curriculum. In other cases, especially when French or English was taught separately to different levels of combined grade classes, pedagogy interacted with organization to raise costs.

In middle schools classes were generally more expensive of teacher time. However, because classes were larger the pupil/teacher ratio was not necessarily higher (Table 52). The extended program taught to these grades (School F) in 1976 did not add cost, largely because of the integration of French teachers into the teaching team.

Immersion and regular programs taught at the same school (B and E) in 1976 have comparable teacher costs per class, in part because both schools make an effort to equalize planning time among all teachers at the school. Differences at School B in 1973 resulted from the use of paraprofessionals in the immersion classes, a practice that has been discontinued. At School E in 1973, immersion used slightly more teacher time per class than the regular program, but the difference was less than 5 per cent of total costs. Among elementary schools and among grade levels within overall programs, there are greater differences than between immersion and regular or extended and regular programs at the same grade and school.

Comparisons between the 20-minute and 40-minute program are not straightforward since they do not occur at the same schools at the same grades. In Schools C and H in 1973, the 20-minute program did appear to be less expensive of teacher time. Cross-board comparisons are confused by the addition of other specialists to the 20-minute program in Carleton schools.

From the organization at these schools we may infer that the 40-minute basic French program tends to increase total planning time over the amount in the 20-minute program, but that the immersion program and the 40-minute basic French program tend to incur about the same teacher costs. However, individual schools will differ in costs for any program, depending on the kinds of specialists teaching the program, the number of classes which specialists must teach, the re-assignment of class teachers freed by a specialist, and the class size for various programs.

Chapter Six: Teacher Utilization in Secondary Schools

This chapter will discuss the utilization of teachers for programs in the secondary schools. Four secondary schools were examined, including two which offered bilingual programs.

The student/teacher organization in secondary schools differs from that in earlier grades. In elementary and intermediate schools a program which allots the available instruction time to various subjects is designed for a group (usually one or more classes) of students. Although there may be a choice of programs, such as immersion or regular, the student has no choice within the program (unless an options element is included as a small 'non-credit' part of the program). The problem for the administrator who wishes to make good use of his staff is to make up classes of students which have similar program needs and assign teachers to cover these classes. He deals, by and large, with 'bundles' of students and costs will depend not only on the size of the bundles but on how well he can fit them into the staff time available.

In secondary schools these notions -- of program, class, and student -- take on different aspects. There is no program which allocates the time of a block of students throughout the day since students have choice of the courses which will make up their individual programs. Classes consist of those students who take a subject during the same period from the same teacher, but whose overall programs may be quite different. Students become demanders of seven or eight or nine 'credits' and may be thought of in terms of these credits. Furthermore, students in high school may have 'spares' when no teacher is 'responsible' for instructing them. Because of

individual programming and of student 'spares', it is not practicable to make program cost tables as was done in elementary schools.

The cost of a student's program is the sum of the cost of each credit in that program. The cost of a credit will be determined by class size and the proportion of school time that the teachers of the subject are expected to devote to teaching. These factors, in turn, are influenced by the policy of the board about the normal teaching load, the popularity of the course, and the size of the department.

Because the cost of a student's program is the sum of the cost of each credit in his program, programs will cost the same if they contain the same number of credits and if credits in different courses cost the same. The next section will consider whether there are differences in costs per credit among subjects and, if so, what gives rise to these differences. As in the preceding chapter only teacher costs will be considered here. The cost of supplies is discussed in Chapter Seven.

BOARD POLICY AND COST PER CREDIT

The cost of offering a 'credit' depends on two factors: 1) the amount of planning time for teachers of the course, and 2) the ratio of student instruction time to teacher instruction time, determined by the average class size for all sections of the course.

A course credit may be supplied only by those teachers who are specialists in the subject area of the course. Teachers are organized into departments which offer courses in each subject area. The size of the department will depend on student demand for courses in the subject and on class size constraints for the subject set by boards. Within limits, however, departments have some autonomy in offering subjects for students to take and the departmental organization of teachers has some influence on per credit costs.

Planning and Administrative Time. Like most secondary teachers, those in the schools examined here are given 'free' periods for planning, grading papers, meeting with students, parents and colleagues, etc. Three of the schools, Q, R and S, have eight periods a day available for instruction and, in conformity to board policy, full-time teachers are expected to instruct for six of these periods. Part-time teachers also teach 75 per cent of the time they are in the school. So long as this policy is rigidly adhered to for all teachers, the amount (and, therefore, average cost) of planning time will be the same for all courses.

In addition, however, the head of the department is given an extra 'free' period to handle administrative duties. Thus, the number of classes which a department can normally teach equals one less than the number of full-time equivalent teachers in the department times six. For example, a department with 10 faculty members will teach 59 classes (60 less one); a five-man department can handle 29 classes (30 less one). Because the 'cost', in terms of staff time, of the department head is the same for all departments it increases the cost per credit of smaller departments more than larger departments. However, heads of one or two person departments usually do not take the extra time, and in some departments this time is used to provide a course which otherwise could not be offered.

In School P, at the other board, the school day contains nine periods on a complex rotating pattern. However, teachers are expected to instruct for about the same number of minutes as in the other schools, and although this represents a somewhat shorter portion of the available instruction time, students have more 'free' time and the ratio of class instruction time to teacher time is similar. Because of the complexity of the schedule, and because it works out to about the same amount of planning time, it will not be considered

in detail. The policy regarding headships is also similar to the other schools.

To reiterate, where a board policy setting the amount of planning time per teacher is rigidly followed -- as it was in the schools examined -- the cost of planning time per class will be the same for all courses. However, if extra administrative time is allowed for the head of departments this will increase the cost of courses given by large departments less than those given by small departments. In the schools examined this effect was noted in smaller departments, but in the smallest departments either no head was designated or he did not have the extra period, thus eliminating the extra administrative costs.

Class Size Differences. Even if per class costs, based on the ratio of the teacher's spares to instructional periods, are the same for all subjects, the per credit costs will vary if class sizes are unequal. Board policy on class size in secondary schools does vary by subject both in general and in the exceptions allowed.

Teachers are allocated to schools on the basis of students to be taught. In one board approximately one-sixth of a teacher is assigned for each 27 credits of advanced academic courses, 26 credits of general academic courses, 22 credits in second language courses, and 15 to 19 credits in technical, vocational and home economics courses. Thus, in this board teachers' salaries for second language course credits can be expected to run about 18 per cent above salary costs for other advanced academic courses. As indicated in Tables 53-54, average class sizes in Schools R and S tend to follow these guidelines although G phase classes tend to be much smaller than A phase classes at all levels. No technical courses were offered at School R. In the second board class size expectations vary by subject: 30 in English, mathematics, history, geography and science; 27 in

TABLE 53

AVERAGE CLASS SIZE IN SELECTED SUBJECTS BY LEVEL AND PHASE:
SECONDARY SCHOOL R, FALL, 1976

SUBJECT Phase	GRADE					All
	9	10	11	12	13	
ENGLISH AND DRAMA						
G	13.0(4)	15.0(1)	-	-	-	13.4
A	28.3(7)	24.4(9)	26.0(15)	26.4(7)	24.8(5)	26.0
E	-	28.0(1)	-	-	31.0(3)	30.3
All	22.7	23.9	26.0	26.4	27.1	25.1
FRENCH						
G	-	26.0(1)	19.0(1)	12.0(1)	-	19.0
A	24.8(6)	23.7(6)	25.0(4)	26.0(4)	21.5(4)	24.2
E	-	27.0(1)	15.0(1)	22.0(1)	17.0(1)	20.3
All	24.8	24.4	22.3	23.0	20.6	23.2
HISTORY AND GEOGRAPHY						
A All	28.4(9)	31.6(5)	28.0(5)	29.6(6)	27.3(6)	27.9
MATHEMATICS						
G	-	20.0(1)	33.0(1)	26.0(1)	-	26.3
A	28.8(6)	27.0(5)	27.1(7)	21.5(8)	26.6(13)	26.1
All	28.8	25.8	27.9	22.0	26.6	26.1

TABLE 54

AVERAGE CLASS SIZE IN SELECTED SUBJECTS BY LEVEL AND PHASE:
SECONDARY SCHOOL S, FALL, 1976

SUBJECT Phase	GRADE					
	9	10	11	12	13	All
ENGLISH AND DRAMA						
G	19.7(3)	21.8(4)	19.8(7)	23.0(4)	-	20.9
A	30.7(7)	29.2(5)	28.8(6)	29.2(5)	29.4(5)	29.5
All	27.4	25.9	24.0	26.4	29.4	26.2
FRENCH						
G	20.0(3)	21.0(3)	22.0(3)	-	-	20.8
A	24.1(7)	27.0(5)	21.6(5)	22.0(4)	25.0(2)	23.9
E	-	-	-	30.0(1)	17.0(1)	23.5
All	22.9	24.8	21.7	23.6	22.3	23.2
HISTORY AND GEOGRAPHY						
G	27.5(2)	21.3(3)	26.0(5)	32.5(2)	-	26.2
A	29.6(9)	35.9(7)	28.0(5)	30.5(4)	25.3(4)	29.9
All	29.2	30.1	27.0	31.2	25.3	28.9
MATHEMATICS						
Rem	13.0(1)	-	-	-	-	13.0
G	17.5(4)	21.5(4)	21.0(5)	19.8(4)	-	20.0
A	34.4(5)	30.8(5)	31.8(5)	27.5(4)	26.5(9)	29.8
All	25.5	26.7	26.4	23.6	26.5	25.8
TECHNICAL						
G All	20.8(9)	20.7(9)	17.6(5)	16.0(5)	-	19.3

The number in parentheses is the number of classes.
G - general, A - advanced, E - enriched.

language, physical education, theatre arts and business; 25 in art, family studies, music and home economics; and 22 in technical courses. As indicated in Table 55, class sizes of School P are slightly below this level (brought down by smaller G phase classes), but differences are present between the categories of classes.

The general rule at these schools is that where demand for a course is small, less than about 20, the course may be dropped, but this does not always happen. At all the schools there are some classes which are very small. Level three and level four German courses are offered at School R to classes of 11 and 12 students, level five German is offered at School Q to a class of nine students and at school R to five students. Some music classes at Schools R and S also have fewer than 15 pupils. Remedial classes in English and mathematics at School P have 14 and 12 students. Thus, although these schools, all with more than a thousand students, have enough students to maintain fairly large average classes, they also have very small classes to cater to the demands of some students.

There are two mechanisms which allow these small classes to exist. First, departments have a certain amount of autonomy in deciding course offerings. If the overall average class size for the department can be maintained or if a department member, often the head, is willing to teach an extra class, then a course may be offered when demand for it is small. Naturally, such courses tend to be part of a sequence of contents that a department believes are important for serious students in the discipline. At Schools R and S the small music offerings are a sixth class for the head, or a seventh class. The mathematics department at Schools Q and R offer some classes to small enrolments while maintaining a respectable overall average.

TABLE 55

AVERAGE CLASS SIZE IN SELECTED SUBJECTS BY LEVEL AND PHASE:
SECONDARY SCHOOL P, FALL, 1976

SUBJECT Phase	GRADE					All
	9	10	11	12	13	
BILINGUAL - FRENCH LANGUAGE ARTS						
A-All	19.0(4)	21.0(2)	-	-	-	19.7
BILINGUAL - HISTORY IN FRENCH						
A-All	18.0(2)	16.0(1)	-	-	-	17.3
ENGLISH AND DRAMA						
Rem	14.0(1)	-	-	-	-	14.0
G	29.0(3)	26.0(3)	27.0(3)	29.0(3)	-	27.8
A	31.0(8)	28.8(9)	30.3(8)	29.3(6)	30.0(4)	29.9
All	29.1	28.1	29.4	29.2	30.0	29.0
FRENCH						
G	20.6(3)	27.7(3)	24.5(2)	34.0(1)	-	25.3
A	28.1(7)	28.6(5)	23.6(6)	27.3(3)	22.5(2)	26.4
All	25.9	28.3	23.6	29.0	22.5	26.1
HISTORY AND GEOGRAPHY						
G	20.8(4)	26.0(3)	26.5(2)	30.0(1)	-	24.4
A	32.3(11)	27.6(11)	30.2(9)	24.8(6)	30.0(4)	29.3
All	29.2	27.3	29.5	25.6	30.0	28.3
MATHEMATICS						
Rem	12.0(1)	-	-	-	-	12.0
G	19.3(3)	24.3(3)	24.0(5)	27.0(3)	-	23.7
A	32.4(7)	32.0(7)	32.2(6)	29.8(5)	29.0(8)	31.1
All	27.0	29.7	28.5	28.7	29.0	28.5
TECHNICAL						
All	19.4(7)	19.4(8)	19.8(5)	17.3(3)	27.0(1)	19.5

The second mechanism for keeping a small class is a policy decision at the board level to continue to offer a course for which demand is low. The level five German course at School Q is a case in point. Board policy maintains some course offerings at some schools because these courses are considered to be needed to make a full range of programs available. Registration is open to all students in the board and staff above the normal allotment is given to the school to cover the courses.

These policies and practices must be kept in mind when asking the cost of special programs to promote French bilingualism, considered in the next section.

BILINGUAL HIGH SCHOOLS

Two of the four high schools, P and Q, have bilingual course offerings. In this section the question of costs of these programs will be examined. The bilingual programs at the two schools differ, both with respect to their integration into the school structure and student demand.

The bilingual offerings at School P are few. The program was begun in 1975 to meet the needs of one class of students coming from the experimental intermediate entry immersion program at one feeder school. Entry into the intermediate program was limited during the first two experimental years, and it is these students who are enrolled in School P's bilingual program. Classes of 27 were formed in grade 7 at the beginning of the experiment but attrition has left only 16 students in grade 10 (Table 55 - note that a few other students enrolled in the bilingual language arts). The small classes in high school are a direct result of the limitations on enrolment into the experimental program. After 1975 more students were allowed into the late entry program in grade 7, in order to overcome the problem of attrition.

The program consists of two French language arts and history taught in French. History was chosen because a staff member was available with a specialty in history as well as French and this person is a member of both departments. Students enrolling in the bilingual program are required to take all three courses each year. Clearly, the low class size requires staffing above the usual per credit allotments and this extra staffing is provided by the board. It is hoped that when more students come from intermediate entry immersion and

when primary entry students reach high school, the numbers in the program will be sufficient to maintain normal class sizes. It should be noted that the teacher of the bilingual option courses has the normal amount of planning time given in the school. Furthermore, because the courses are integrated into the language arts and history departments, no additional departmental administrative time is charged to the program. At present, then, the status and costs of the program are similar to those of the German program in the other board -- the program receives extra staffing from the board in order that it may be offered to a group of students who want it.

At School Q the bilingual program is more ambitious in terms of courses offered and students enrolled. Students choosing the bilingual option normally take two French language arts and two of history, geography or mathematics offered in French. Students come not only from intermediate and primary entry programs, but also from French schools and from basic French programs. Therefore, students differ widely in French ability and sections must be scheduled for various skill levels.

The teachers of the bilingual subjects form their own department, the second largest in terms of credits in the school. Its extra administrative time therefore adds less to per credit costs than in most other departments. Planning time for these teachers is standard.

Table 56 indicates the class size separately for the bilingual subjects taught in French and for the French language arts. It is to be noted that the average for bilingual language arts and for the basic French program are fairly close, 21.8 and 22.1; and that the other bilingual subjects are taught to classes slightly below those of the corresponding English language departments. The possibility

TABLE 56

AVERAGE CLASS SIZE IN SELECTED SUBJECTS BY LEVEL AND PHASE:
SECONDARY SCHOOL Q, FALL, 1976

SUBJECT Phase	GRADE					All
	9	10	11	12	13	
BILINGUAL - FRENCH LANGUAGE ARTS						
G	-	21.7(6)	20.5(6)	-	-	21.1
A	19.3(12)	25.8(4)	25.3(4)	22.9(6)	27.5(2)	22.4
E	-	19.0(2)	17.0(1)	22.0(1)	-	19.6
All	19.3	22.6	21.9	22.7	27.5	21.8
BILINGUAL - HISTORY, GEOGRAPHY AND MATHEMATICS IN FRENCH						
A-All	26.0(9)	28.5(9)	23.4(8)	24.3(4)	-	25.8
ENGLISH						
A-All	26.6(11)	27.1(17)	27.8(12)	27.5(21)	28.3(14)	27.5
FRENCH						
G	15.0(2)	20.0(3)	14.5(2)	22.5(2)	-	18.2
A	24.0(5)	23.0(6)	25.7(6)	21.2(6)	24.0(4)	23.5
E	-	-	-	-	19.0(1)	19.0
All	21.4	22.0	22.9	21.5	23.0	22.1
HISTORY AND GEOGRAPHY						
G	-	21.5(2)	28.0(3)	-	-	25.4
A	26.4(11)	29.3(8)	27.9(11)	21.2(11)	27.4(13)	26.3
All	26.4	27.7	27.9(14)	21.2	27.4	26.2
MATHEMATICS						
G	-	29.0(2)	22.3(3)	20.0(3)	-	23.1
A	27.4(8)	26.0(9)	27.4(11)	28.5(8)	28.6(12)	27.6
E	-	37.0(1)	37.0(1)	21.0(1)	27.0(1)	30.5
All	27.4	27.4	27.0	25.8	28.5	27.2
TECHNICAL (DRAFTING)						
G-All	21.0(2)	17.5(2)	25.0(1)	-	-	20.4

remains, of course, that by drawing students away from basic French and subjects in English the bilingual program has affected class sizes generally. This does not seem to be the case, however. Mathematics and French departments achieve the sizes specified in the guidelines (27 and 22). Geography achieves an average class size of 26.8 (nearly 27) with a total of 536 credits, while history, with nearly twice the total of credits, has smaller classes, 25.9 on the average.

It appears, then, that in School Q, where enrolments in the bilingual program are large, the additional costs of the bilingual non-French credits are essentially equivalent to a one student per class difference in class size, or about 4 per cent per credit. As indicated in Table 57, the credits per teacher for the bilingual program are greater than for modern language departments at this board, but below geography, history and mathematics, which are included in the bilingual program.

ELEMENTARY/SECONDARY COMPARISON

In elementary schools classes remain together throughout most of a school day, and are the basic cost-incurring units. The initial technique for analyzing instructional costs (in Chapter Four) related teacher costs directly to the class taught. However, for more complex organization -- for example, where different levels of a combined grade class worked for a time under different teachers -- it was necessary to have 'program element' intervene between the class and teachers. The program element was a subject or group of subjects. Teachers contributed time to the program element, and classes drew on this time for instruction in the element. Not only did this concept allow the teacher to be separated from the content taught, but it also enabled the separation of the contribution to costs by subjects which might differ in the ratio of teachers' planning time to class instruction time (P), the salary level of teachers (M), or the size of the student group taught relative to the 'normal' class size (represented by its reciprocal, I). A weighting factor (W), equal to $M(I + P)$, was indicated for each program element on the tables for each school. The W for each element is multiplied by the proportion (C) of the total available instruction time spent on the element in the program and the CW's for each element are added together to get the total program cost.

TABLE 57

COMPARISON OF AVERAGE CLASS SIZE AND CREDITS PER TEACHER BY
SUBJECT AT FOUR OTTAWA-CARLETON SECONDARY SCHOOLS, FALL, 1976

	Q		R		S		P
	$\bar{Z}^*$	CR/T	$\bar{Z}$	CR/T	Z	CR/T	Z
ART	24.7	148.0	24.6	147.8	22.6	129.1	23.6
BILING. FRENCH	21.8)	138.6	--	--	--	--	19.0
BILING. OTHER	25.8)		--	--	--	--	17.3
CLASSICS	25.4	152.6	22.3	134.0	--	--	--
COMMERCIAL	27.3	158.9	28.1	157.9	27.6	159.5	26.8
ENGLISH & DRAMA	27.5	150.7	25.1	147.2	26.2	153.4	29.0
FAMILY ST.	17.0	102.0	22.9	129.7	24.3	146.0	20.5
FRENCH	22.1)	132.8	23.2)	135.8	23.2	134.8	26.1
OTHER MOD.	25.0)		09.3)				
GEOGRAPHY	26.8	153.1	26.8	152.0	27.9	158.3	28.0
HISTORY	25.9	151.6	28.9	167.4	29.4	169.2	28.6
MATHEMATICS	27.2	160.5	26.1	151.4	25.8	150.9	28.5
MUSIC	26.6	146.5	21.9	131.3	17.9	116.5	28.5
PH.ED.	25.1	145.8	26.7	155.2	28.0	163.1	26.8
SCIENCE	28.2	166.4	25.5	149.0	26.8	156.3	29.1
TECHNICAL	20.4	122.4	--	--	19.3	112.7	19.5

* Z = Average class size

CR/T = Credits per full-time equivalent teacher.

At the secondary level, because 'classes' do not remain constant over the school day and because 'programs' are not put together to be offered to such classes, it would at first appear that a similar analysis would be extremely complicated. A program consists of the courses a student is taking to earn seven or eight credits and it may happen that few students are taking identical programs. In a large school such as Q, which had over 1,500 students and offered more than 150 different courses, there would be hundreds of individual programs.

However, the organizational structure of the secondary schools studied here (and there is no reason to believe they are unusual) make the determination of costs *less* complex than would at first appear. To see why this is so, we will take each of the four ratios, C, I, P and M, which make up the cost weighting factor and indicate what properties it would have at the secondary level.

In elementary schools it is assumed that the student must be 'instructed' or otherwise cared for throughout a full school day. At the secondary level, however, students may have 'spares', time during the school day when they are not being instructed (although the school as an environment may still have some responsibility for them). Each full-credit course the student takes draws approximately one period per day of student instruction time.* Therefore, each full course is the same proportion of a normal student load (in these schools, of eight courses). For purposes of cost, a student ceases to be a person and becomes a demander of eight credits. A student who

* This was the case in the schools studied here. Where there are courses with 'extra' instruction, such as labs in science, this extra instruction might be costed as a 'piggyback' cost to the regular period, handled similarly to the cost of paraprofessionals in elementary school B.

carries only seven courses is only 87.5 per cent of a student. A student in School P could take nine courses and would become 112.5 per cent of a full-time student. Each credit makes the same demands for student instruction time and so, in secondary schools, C is the same for all credits. Program costs will differ when they contain different numbers of credits, but not because credits with different costs take up different proportions of time.

For elementary school program elements, I was obtained by dividing the class instruction time given by teachers. Its reciprocal was the ratio of the class size for the element of the 'normal' size of the class for other program elements or for the rest of the school day.

At secondary school, however, the class is not on-going, so there is no base on which to anchor this ratio. However, I for a course can be approximated by using the reciprocal of the average class size for all sections of a course divided by the average class size in the school or board.

In the secondary schools we examined the amount of planning time *per teacher* which is known from teachers' schedules and is much the same for most departments. The basic proportion of teacher time allocated to planning was .25, but some extra must be added to cover the extra time given the head. In a six person department this would add .02. This proportion of teacher time allocated to planning (P_t) is not the same as P in the elementary cost weighting analysis. P was the amount of teacher planning time *per class instruction time* -- it varied not only by the amount of time given the teacher, but also depending on whether the instruction with which it was associated was given to full sized classes. As with I, a P for secondary schools can be estimated: P equals approximately P_t times the estimated I.

Therefore, the phrase $(I + P)$ in the cost weighting factor W becomes in secondary schools $(I + P_t I)$. This in turn equals $(1 + P_t)I$.

Although this expression is interesting in that it indicates something about the trade-offs that can be made between class size and planning time (illustrated in the sample schools by some music and classics teachers giving up planning time to teach small classes of less popular subjects), it is not very useful. The credits per teacher of subjects can be found directly with the same information and is a more accurate indicator of relative costs of subjects. Variations in the number of credits per teacher reflect variations in both subject class sizes and amount of planning time. However, since planning time tends to be relatively constant (with the exceptions noted) the credits per teacher is mainly a reflection of class size.

This study did not examine salary ratios (M) at the secondary level. All teachers in the schools within a board were under the same salary schedule and so fluctuations by subject would primarily be the result of differences in experience caused by the recent expansion of bilingual departments or contraction of other departments.

The high schools examined here were larger than the elementary schools and offered much greater variety in programs. However, this range of options can only be offered within a structure of periods which means that each subject taken by a student fits into a time slot. Because of this structure, the costing unit at the secondary level is not whole student programs, but the cost of offering courses, or cost per credit. Variations in costs per credit, however, still hinge on the same parameters that elementary programs did: class size and planning time for teachers.

As has been noted before, board policies with respect to class sizes, planning time and administrative time for department heads will affect costs. Alternative programs can be offered in these large schools for bilingual options under the normal policy guides where enrolment is sufficient. Where not enough students ask for the program, the options can be preserved, like ancient Greek, German or special music courses, only because special arrangements are made either at the board or school level.

Chapter Seven: Instructional Supplies

Instructional supplies do not consume a large proportion of a school system budget. Instructional supplies and expenses other than salaries together accounted for about 8.5 per cent of the net day school expenditures for elementary schools and 9.6 per cent of expenditures for secondary schools in Ontario in 1975 (Ontario, n.d.). They account for less of the total educational costs. Statistics Canada (1977) indicates that instructional supplies consumed between 3.5 and 5 per cent of total school board expenditures in Canada from 1960 to 1975 (between 4 and 5.5 per cent in Ontario).

Nevertheless, instructional materials may be more important to educational outcomes than their budgetary allocation might indicate. They carry the program message in permanent, tangible form, supplementing the teacher's vocal presentation; they enable a student to review the message at home; they provide a medium through which he may work out his own understanding of the program information; and they afford a convenient means for the teacher to examine and evaluate this understanding. McLuhan's statement 'the medium is the message' has become conventional wisdom. It implies that the type, quality, and quantity of the materials will be part of the school message to the child. The availability of instructional supplies seems also to carry a message to teachers, contributing to their morale.

This chapter will be concerned with the cost of instructional supplies for French as a second language programs in the Ottawa and Carleton schools, and will examine parameters of materials that affect dollar costs. Instructional supplies, as the term is used here, will include such things as text books, workbooks, pencils and scribblers

given to students, ditto sheets used in class work, art supplies, globes, reference dictionaries and atlases, and bristol board used in making a class project. Although perhaps stretching the term, this chapter will also include the teacher's guides and reference books which accompany the texts and workbooks. Library materials will also be discussed since many of the cost-relevant problems are the same for both texts and library books.

This chapter will discuss the tangible objects which the word 'materials' implies. The intangible content -- the concepts covered by a text, the pedagogical approach used, the organization and sequencing of the subject matter, etc. -- will be neither evaluated nor discussed. However, it should be noted that these are important aspects to any evaluation of program effectiveness. The reason that they will not be considered here is a belief that the quality of thought or content is not intrinsically related to the materials which carry it to the student. The prime concern of this chapter is with the cost of materials and with the related aspects of availability, material quality, and quantity needed to service a program.

The next section will indicate by an analogy why determining costs or needs for instructional supplies is so difficult. Then, the way the two boards budget for instructional supplies will be discussed. The latter part of the chapter will examine the costs and related parameters of the instructional supplies for a program.

AN ANALOGY

At the outset it should be noted that it is probably impossible to determine what instructional supplies are 'needed' by a program. Although some curricula are closely related to a text and/or workbook, many are not, and, even for programs defined by a text, there are

other instructional supplies which may or may not be used, or may be used to varying extents.

Outfitting a program with instructional supplies has a lot in common with buying a wardrobe. In both cases, the definition of what is 'necessary' will depend in large part on the budget available (although it may exceed the budget). For either there is a wide range with respect to quality, quantity and kind, and no real limit to what could be bought if the money were available. Presumably one needs something to wear, but 'something' may mean a hand-tailored suit by Givenchy, a Russian sable greatcoat, and appropriately elegant shoes, bag, gloves, scarf, hat, and lingerie. Or 'something' may be a polyester housedress from Woolco and a pair of slippers. A wardrobe may contain a variety of coats and jackets for various weather conditions, dresses for all occasions and accessories for every mood, or it may contain a single coat and a few mix-and-match separates. Even within the same price range, one may choose to buy a few expensive things of classic styling or many less expensive outfits in a variety of colours and styles. Frequently the choices to be made are between things which are not really comparable: winter boots or a spring jacket? A new hat or new slacks? The choice will be based on what the person already has and on what is available in the stores at what price, as well as on some individual estimate of 'need'.

Similarly, the materials for use with a program may be few or many, cheap or expensive, specific to particular needs or more generally useful. Quality may sometimes be substituted for quantity or quantity for quality. The many choices about program supplies also must be made between things that are difficult to compare: New math texts or workbooks in spelling? Cuisenaire rods or a set of storybook readers? Just as clothing choices will depend not only on the money

available, but also on where they are to be worn and the style of the person, so instructional materials must be appropriate to the students and the community on the one hand, and suited to the pedagogical style of the teacher on the other hand.

It is also true that instructional materials, like clothing, may be either 'store bought' or made at home at a saving, and just as there is a world of difference between 'hand-tailored' and 'homemade', so the value of locally developed materials will depend on the skills and knowledge of the teachers and consultants who develop them. These must include talents related to illustration, graphics and layout, as well as the more usual pedagogical skills.

BOARD POLICY AND BUDGET ALLOCATIONS

Because 'standards' or 'minimum' needs or 'baseline' costs for instructional materials are not available and because different programs use different types of materials, defining the cost needs of programs in some abstract sense is impossible. Furthermore, the actual costs of supplies do not provide an alternate means of getting necessary costs because expenditures are determined by budget allocations and by the distribution and use of those allocations in the schools. How much a school system budgets for instructional supplies will set the total amount available for their purchase and the priorities and beliefs of the people who spend these allocations will tend to determine what portion is spent on what type of instructional supplies for program A and how much on what for program B. These priorities differ from school to school.

In this section, the budget allocations made by the two boards in the study will be discussed. Later sections will discuss the parameters associated with costs of instructional supplies and possible

sources of difference among programs, especially with respect to programs demanding French language materials.

General supplies allocation. For the maintenance of ongoing programs, both boards in this study allocate funds for books, teaching aids and classroom consumables on a per pupil basis. These funds are assigned to schools on the basis of enrolments and used there at the discretion of the principal. In practice the principal consults with teachers as to the purchases to be made, and often simply reallocates most of the funds equitably among teachers (including library) at the school. Thus, in some schools some funds can be assigned to classes and programs (but not usually program elements or subjects) on the basis of which teacher spent it. At all schools, however, some portion of the money goes for supplies, such as ditto paper or stencils, which are difficult to trace to either teachers or classes.

TABLE 58

BUDGET ALLOCATION FOR INSTRUCTIONAL MATERIALS,
OTTAWA AND CARLETON BOARDS OF EDUCATION, 1977 BUDGETS

	Per Pupil Allocation	
	Elementary	Secondary
Carleton	\$25.08	\$51.01
Ottawa	\$25.98	\$42.75

The per pupil amounts allocated by each board for instructional supplies are shown in Table 58. For both boards these sums include allocations to library. In Carleton Board the per pupil allowance is split between a book allocation (\$10.68 for elementary and \$23.98 for secondary) and an allocation for consumables (\$14.40 and \$27.03).

However, the distinction is generally not rigid with respect to what is purchased with the funds. In Ottawa portions of the allocation are designated for shops, home economics, library and guidance. In addition to these per pupil funds at the secondary level there are 'per shop' allocations for specific vocational programs.

For each board the per pupil funding for instructional supplies is the same for both the regular English program and the French immersion program. They cover materials for core French in the regular program and English to immersion for that program. Thus, with respect to the board's basic budget allocations for instructional supplies, the two programs receive the same per pupil funding.

Since these per pupil funds are assigned to schools on the basis of enrolment, it is apparent that where the two programs are taught at different schools -- as is the case with schools having only regular programs and with two immersion schools in Carleton -- the programs receive the same money for instructional materials. However, in many schools the two programs exist side by side, in which case the actual purchase of materials for each program may not be equal. There is evidence from one school that this does, indeed, happen (see Table 59). Principals of dual program schools in Ottawa seem to agree that the French immersion program needs somewhat more money for instructional materials, but in the Carleton Board there is a stronger belief that the program costs for materials can be and should be equal. Possible sources of cost differences will be discussed in later sections.

Extra funding is available on an ad hoc basis for Carleton's extended French program. Up to \$500 is available to schools with this program, where the need for supplies can be justified.

TABLE 59

COSTS OF INSTRUCTIONAL SUPPLIES AT AN OTTAWA SCHOOL
WITH TWO PROGRAMS, 1975-76

	Per Pupil Expenditure	
	Regular	French Immersion
Kindergartens	\$ 9.75	\$ 9.75
Grades one-three	26.44	40.62
Grades four-five	15.55	40.62
Grade six	15.55	20.25
Grade seven-eight	25.80	25.80

So far only the general per pupil budget allocation for instructional materials has been discussed. Before turning to other sources of funds for instructional materials, it should be emphasized that this is *maintenance* funding, to provide materials for use in ongoing programs which already have some texts, reference books and the like in the classroom.

Other channels. Yet another way in which money for instructional supplies may seep into the schools is from funding of consultants and their offices. However, the amounts of money going into the schools for ongoing programs in this way are almost impossible to determine. Consultants' offices generally operate on budgets designed to provide only for the needs of consultants. Although some materials may go from them to teachers (e.g., at workshops), these are usually not for distribution to students. They are more likely to be teacher aids, e.g. reference books, material which may be dittoed for distribution to the class, flashcards, or other teaching aids. Some of this material may merely be loaned to teachers. For example, science project kits covering particular topics and containing both teacher reference

materials and instruments for student use may be borrowed while the teacher covers that topic. Such borrowed materials might be costed to programs as if they were rentals from the consultant's department, but records of use by programs are not kept and some teachers of a program use them and others do not. Other material given to teachers, such as sheets from which stencils may be made, may be of value only for the content, with the dollar costs (of paper) practically nil. These materials are often duplicated by the board printing services, in which case the costs to the consultant's office is only that of the paper and ink, since the general board budget covers salary and capital costs of this service. For most subject areas, consultant office budgets at either board are not large enough to allow much seepage of materials into the schools from this source.

The French consultants' budget, with its additional federal-provincial funding, is likely an exception, however. Beginning in 1973 this money enabled French language consulting staffs and their office budgets to be expanded in order that new programs might be developed. Thus, in the development and installation phases of the experimental French programs, fairly large amounts of materials for French as a second language programs probably passed through the French consultants to supplement the normal per pupil budget allocation of immersion classes. Although data are sparse on the amount of material which reached classrooms in this way, there was some, and probably more, in Ottawa than in Châtelet.

Much of this money was spent for in-board program development, which resulted in thick books containing both curricular outlines and materials, such as stories, songs and other aids for the teacher and pictures or work sheets which could be turned into ditto sheets and passed to the students. The cost of the curriculum books for the

teacher comes from the consultant's development fund, while the cost of the ditto master and paper for the students comes from the school's per pupil allocation. For the immersion program in Ottawa, curricular material for science and social science was developed in conjunction with the regular subject consultants and teachers, resulting in parallel curricula in English for regular program and in French for immersion. A copy of these curriculum guides was duplicated by the board's printing service and supplied to each teacher of the appropriate grades. The cost of developing these programs will be considered separately in a later chapter on curriculum development. The extra cost of printing sets in each language was primarily the set-up costs of multilithing in the 'other' language (that is, labour costs to general printing services, which were not included in the cost of the curriculum guide book). Most of the language arts material for immersion has been developed locally and is available through special funding. In the regular program this material would come from the per pupil allowance.

Apparently other supplies (workbooks, flashcards, etc.) for immersion classes were also available from consultants in the early years, although it is practically impossible to determine the amount, type or cost. Specific mention has been made of teaching aids (e.g., flashcards) and of consumables. These materials were mentioned by regular teachers in the questionnaire sent out in 1974 (see FRENCH Working Paper No. 18, pp. 26-27) and appear to have been a source of bitterness on the part of regular teachers. Such anger is especially mentioned in relation to primary immersion. This bitterness should be recognized as a social cost to the system when unequal funding or unequal resources are allocated to one program and not to another (although services to handicapped children seem to be an exception).

Late immersion teachers in 1973-74 faced a situation where appropriate instructional materials were difficult to obtain anywhere and had to be created by the teachers themselves with the help of consultants.

In 1976-77, because of the resentment coming from regular program teachers over extras for French, since these programs are reaching the maintenance phases and since the federal-provincial funds are decreasing, the materials available through French consultants have also decreased. In Carleton the French consultant unit formed in 1973 has been absorbed into the general planning and development office of the board and is mainly concerned with curriculum development. Seepage of supplies into the schools from this source is probably no greater than for other areas of instruction. Principals of any program with specific needs can apply for additional funds through the comptroller. In Ottawa the experimental funds still provide some money for instructional materials. There is a strong belief in Ottawa that materials in French are more expensive to buy and to maintain and so discretionary money is available from French funds. This money is not automatically available to schools or teachers, but they must show that it is needed for a particular purpose, thus avoiding the syndrome of having allocations that 'must be used up' before the end of the budget year.

Both boards are also faced with the expansion of the French immersion program to new grades and larger numbers of students at some grades, and must therefore provide additional supplies for these classes. The two boards respond in different ways to demands for French material, based in part on different philosophies and in part on different circumstances.

In Carleton, where there is expansion in both the regular and immersion programs, allocations of budget moneys for setting-up

classes are the same whether made to French or English. In 1976-77 the board provided a lump sum of \$1000 for setting up new classes at a (furnished) school. In addition, when there are larger numbers of students or additional classes proceeding into a new grade level, an entire year's book allowance for these students is given to the school in September to enable necessary books to be ordered in the fall. (The allowance for consumables is pro-rated for the four months of the school year, since things like pencils and scribblers are needed only as they are used up.) Because Carleton has new classes in both immersion and regular programs, they can be funded at the same level. The Carleton Board believes that the instructional materials allocation 'is a generous one, and if there are small differences in costs between programs these can be absorbed.'

In Ottawa, where numbers of students and classes in the regular program are declining, new classes of French immersion most often take over regular program classrooms. The only necessary new material is in French. Such classes received \$1200 (\$700 for kindergarten) in 1976 and \$1500 in the 1977 budget. Additional funds are also made available to the libraries of schools with immersion in order to provide project and research materials, which are especially important in the junior and intermediate grades (which the leading edge of primary entry immersion is entering).

To summarize: Both boards provide per pupil allocations to the school for instructional materials and at both boards these funds are the same for immersion and regular programs. In general, of course, the schools spend their entire allocation. One can infer, therefore, that the Carleton schools with only immersion students and those with only regular students spend about the same amounts, on a per pupil basis, for instructional supplies. However, at schools where both

programs exist side by side, re-allocations within the school may favour one program or the other. Some Ottawa schools report such unequal allocation between programs.

Another source of additional second language materials may be consultants' budgets with their extra grants for French. In the past quite a bit of instructional material seemed to reach second language programs by this route. However, this may be drying up because of lower levels of funding. In Carleton, especially, there is an effort to fund immersion programs at the same level as other programs (with the possible exception of extended French). In Ottawa extra money is still available for the more costly materials needed by immersion classes.

COMPARISONS OF COSTS

Actual costs of instructional supplies will depend on the kinds of books and materials selected for use, the amounts of each needed and the life span, as well as the initial price per item. As indicated earlier, since programs may use different kinds of materials in different ways, comparisons of costs are complex to do. Furthermore, even where item costs are known, the actual comparability of the materials may be in doubt. In this section we will first compare some per unit costs and then look at reported costs of outfitting primary immersion and regular programs when both are offered in the same school building.

The kinds of materials discussed here are those that involve the use of printed language. Text books, reference materials and teaching aids like flashcards and globes convey a curriculum message through words printed on them. Other materials such as pencils, rulers, scribblers, construction paper, and many science materials do not

carry any printed message. Because this report is focussing on costs of French programs in comparison with English, this parameter of program materials is important.* We assume that the per unit cost of materials without language is the same for both programs.

This section will examine only commercially produced materials. The cost of a book includes two things: the cost of paper, printing and binding and a share of the cost of developing and writing the content. When materials are developed locally many of these costs are hidden. Consultants spend time writing or editing, which may reduce the time they spend advising teachers or may be unpaid overtime. At both boards, some of the labour costs of duplicating are not passed on to users of the service. Thus, true costs of locally produced materials, comparable to the costs of commercial materials, are not available. The costs of curriculum development will be discussed in Chapter Nine.

There is a belief that locally developed materials are cheaper than commercial. They generally lack the colour and artistic craftsmanship of commercial materials, but they are usually more closely related to the content emphasized locally. Comparisons of pedagogical effectiveness have not been made.

List price comparison. One source of data about comparative costs of instructional material in Ontario is the catalogue of approved textbooks put out annually by the Ministry of Education. Table 60 indicates costs for books suitable for anglophone or francophone students in various subjects and grade ranges. At present there is little or no commercially produced material available for anglo-

* Similarly, the metric program called for new materials only where measurement was involved.

TABLE 60

COMPARISON OF PRICES FOR CURRICULAR MATERIAL IN
ENGLISH AND IN FRENCH AVAILABLE FOR ONTARIO SCHOOLS, 1977*

Subject	ENGLISH			FRENCH		
	No.of items	Average price		No.of items	Average price	
		per item	per page		per book	per page
Primary Division						
Mathematics	10	3.99	.020	4	5.18	.018
Music	6	3.26	.028	2	1.25	.026
Science	5	1.59	.047	4	5.97	.029
English	170	2.60	.024	-	-	-
Français	-	-	-	27	3.82	.031
Average		2.86	.030		4.06	.026
Junior Division						
Mathematics	30	4.17	.019	8	6.14	.018
Music	16	3.88	.028	5	1.59	.030
Science	41	2.85	.038	15	4.47	.033
English	128	3.50	.017	-	-	-
Français	-	-	-	52	3.43	-.17
Average		3.60	.026		3.90	.025
Intermediate Division						
Mathematics	16	6.41	.019	9	5.60	.015
Music	21	3.71	.028	5	2.54	.042
Science	53	4.36	.023	14	5.94	.031
English	87	3.79	.017	-	-	-
Français	-	-	-	59	3.25	.019
History	184	2.83	.022	10	5.89	.024
Geography	132	3.28	.040	24	6.07	.042
Business	11	4.71	.022	12	2.63	.051
Average		4.16	.024		4.56	.032

* Data source: Ministry of Education, Ontario: Circular 14,
Textbooks 1977

phones immersed in French, but these immersion students use francophone material, especially in the junior division and above. Averages were obtained by using all the books listed with price and number of pages for the subject, division and language indicated. Both per item and per page costs are shown since it appeared that in some subjects the English offerings included more paperbound, short books designed as a series, while the French offerings leaned toward longer texts. This may explain why the average costs per book for French are higher in the primary and junior divisions (42 per cent and 8 per cent higher respectively); while the costs per page are lower (13 per cent in the primary division and 4 per cent in the junior division). In the intermediate division both the cost per book and per page are higher for French material (10 per cent higher per volume, 33 per cent higher per page).

Table 61 presents a similar comparison for reference material in English and French. French dictionaries average about 20 per cent cheaper than English in the junior division and about the same in the intermediate division, while atlases for the intermediate division are about twice as expensive in French as in English.

Principal's estimates. Although per unit prices may be comparable this does not tell whether prices of outfitting a classroom are similar since different programs may call for different assortments of materials. In 1976, the Ottawa Board attempted to compare the costs of outfitting immersion and regular program classrooms with instructional supplies by asking principals of schools with both programs to estimate the costs for one grade. The figures gathered were to be used in a presentation to the board.* The information given by principals for

* They were made available for this research by personnel of the Ottawa Board.

TABLE 61

COMPARISON OF PRICES FOR REFERENCE MATERIAL IN
ENGLISH AND FRENCH AVAILABLE IN ONTARIO SCHOOLS, 1977*

	N	Ave.	Range	N	Ave.	Range
Primary						
Dictionaries	6	3.13	1.60-6.16	1	-	7.72
Junior						
Dictionaries	4	5.45	4.05-6.72	3	4.37	1.95-6.95
Atlases	4	3.71	2.65-5.00	-	-	-
Intermediate						
Dictionaries	2	7.05	6.56-7.44	5	7.07	1.95-11.96
Atlases	7	5.07	3.45-7.26	3	10.56	9.60-11.25
Senior						
Atlases	3	7.32	4.40-10.60	1	-	11.25

* Source of Data: Ministry of Education, Ontario: Circular 14,
Textbooks, 1977

grades 2 through 5 is presented in the Appendix. Table 62 summarizes these data. Note that total grade costs have not been provided because there appear to be omissions in subjects covered for all grades.

In a discussion of these data principals indicated that extra costs for setting up immersion classrooms come from two sources: the duplication of curriculum materials for two language arts and the differences in cost of books, which favour the regular program. They generally agreed that immersion classes do not use more stencils, scribblers, acetates and supplies of this type.

The English to immersion takes up an hour a day in grades 2 to 5 and is primarily concerned with reading and writing skills, unlike the basic French for regular program students which is primarily oral.

TABLE 62

SUMMARY: COMPARISON OF COSTS OF OUTFITTING IMMERSION
AND REGULAR PROGRAM CLASSROOMS WITH BOOKS AND SUPPLIES*
1976

Grade	Program	English Language	French Language	Math.	Social Studies	Science	Music	AVA Ref.
2	IMM	NA	426	99	120	NA	NA	230
	REG	428	NA	65	120	NA	NA	340
3	IMM	481	744	263	349	26	2	230
	REG	608	95	220	211	10	51	230
4	IMM	584	788	192	287	30	4	NA
	REG	993	NA	155	195	7	NA	NA
5	IMM	98	227	248	NA	NA	NA	664
	REG	367	185**	162	NA	NA	NA	521

* based on classes of 30

** principal estimates cost of \$170 to \$200

Principals commented that the English to immersion teachers try to teach a full language arts curriculum, duplicating some of the French curriculum. For example, one principal cited 'finding the main thought in a paragraph' as being a skill that could be taught in either language. Because they try to cram a great deal into their hour, these English arts teachers rely heavily on workbooks. At least one principal felt that the availability of these supplies did not always improve the program, but in some cases extensive use of materials reduced listening skills and transfer skills. Principals noted that the English to immersion required a pedagogical approach different from that for a regular language arts curriculum. Therefore, these students cannot use the books made available by declining regular program enrolment.

In examining Table 62 (and Appendix), differences in the amount and type of material should be noted. The highest costs for English language arts (grade 4) is 2.7 times the lowest (grade 5), indicating that some principals may have included more classroom material than others. Furthermore, not all subjects were reported for all grades. In addition to such omissions, differences in size of class sets (no doubt related to grouping policy in the class), and greater or less reliance on teachers' reference materials may be noted. Such parameters are related to pedagogical approaches and have consequences for costs.

One other fact should be remembered in examining the tables. The data were gathered in 1976 after more than three years of special funding for French programs, which made extra materials available for these programs. Since principals based these estimates on what was available in classrooms, the immersion class costs may have been inflated by the grants available in previous years. In this connection it is relevant to note again that the Carleton board schools where

only immersion is offered feel that they can buy the necessary materials using the funds equal to the amounts in the regular program.

Library. Duplication of library facilities is another cost of immersion programs. In schools where both programs are being offered (usually with the immersion sector expanding into higher grades), the library is asked to increase its stock of French language books both for leisure reading and for project work. The librarian for the Ottawa Board estimated that titles in French average about 15 per cent higher than in English, although some novels in French are available in cheap editions.

Secondary school texts. At the high school level comparisons may be made across subjects. In the bilingual high school three subjects other than French are taught in the French language, history, geography and mathematics. Cost of texts for these subjects are shown in Table 63. As with all data on texts and supplies costs there are cautions about the comparisons made in this table. The costs are of material available in the summer and fall of 1976 and are not necessarily the text or materials that the instructors would like to have. For example, the head of the history department explained that history courses are changing in material covered and emphasize documents and other sources more than texts. Thus, the 'text' tends to become a reference or guide book with much supplementary material being used. The texts in use may, therefore, not be the text desired and their prices may be only a part of the total supplies necessary.

As in the elementary grades it can be seen that the difference in costs is not constant and English language materials are not always cheaper. However, the average cost is somewhat higher for materials for the French language versions of these courses.

TABLE 63

COMPARISON OF COSTS* OF TEXTS FOR SUBJECTS OFFERED IN FRENCH
AND IN ENGLISH AT A BILINGUAL HIGH SCHOOL, OTTAWA, 1976-77

	Bilingual	Regular
MATHEMATICS		
1A Insights in Mathematics	6.98	
Mathématiques contemporaries 3	7.65	
MT2 (Mathematics for Today and Tomorrow)		8.46
1A total	14.63	8.46
2A Mathematics 10	7.56	7.56
Mathématiques contemporaries 4	7.65	
2A total	15.21	7.56
3A Elements of Mathematics	5.92	5.92
3A total	5.92	5.92
HISTORY		
1A Initiation à l'histoire	1.25	
Mon histoire Québec/Canada		
(tomes 2,3,4,5)	7.95	
Notre héritages européen	NA	
Divers documents	duplicated	
Many Cultures, Many Heritages		9.14
1A total	9.20	9.14
2A How Are We Governed?	1.80	
Decisive Decades	5.95	5.95
Canada and U.S.: Continental Partners		
or Wary Neighbours		2.60
Canadiens, Canadians and Québécois		2.60
Protest, Violence and Social Change		2.60
2A total	7.75	13.75
3A Civilisations anciennes et du Moyen-Age	5.95	
The Enduring Past		7.95
3A total	5.95	7.95
GEOGRAPHY		
1A Nouvelle Géographie du Canada	10.08	
Canada: A New Geography		7.80
1A total	10.08	7.80
2A Collection Pernet 5e et 4e	9.80	
Through Europe and Asia		8.15
2A total	9.80	8.15
3A Atlas Oxford	8.60	
Le Paysage canadien	7.00	
Canada, une interprétation géographique	10.35	
Physical Environment		9.30
Canadian Landscape		8.60
Topographic Map and Air Photo		
Interpretation		8.76
	25.95	25.66

* Costs are list price from Circular 14 for most items.

MAINTENANCE COSTS

The data presented so far refer to the set-up costs of teaching courses, but the maintenance of materials represents another aspect of materials costs. Once a set of textbooks are bought for a class these must be replaced when lost or worn out. Thus the durability of the books is an important parameter of cost.

There was almost unanimous agreement among principals of schools where both immersion and regular programs are offered that the materials in French for immersion are of a poorer quality than for the English. One principal indicated that, on the average, bindings of English materials last for five years while bindings on French texts have a life expectancy of only two years. The library consultant indicated that this was also true for library books. Few French language books come in library bindings. Unless rebound, they have a life expectancy of 10 circulations, compared to perhaps 50 for an English book with library binding. At the secondary level, this difference in binding means additional checking of books at the end of the year to make sure all pages have been returned.

It is worth mentioning that one principal noted a decline in the durability of newer English language materials. If this represents a trend in the industry, then the problem with the immersion material may result from the fact that all immersion material is new, whereas the English materials to which it is being compared were produced over a longer period.

One solution to this problem is to rebind books even before they go to the students. Costs of binding depend on the size of the book, but run about \$2 to \$4, with uncirculated books being somewhat lower. Rebinding not only adds costs, but also takes time.

In addition to durability, French books are not as readily available. French material is frequently not carried in stock, thus causing delays after ordering.

A final consideration in maintenance of textbooks is that the total number of books needed will equal the number of students expected to register, plus some for a margin for error. As programs or streams proliferate, extra books will be needed because texts must be purchased for the maximum number of students expected in each program stream. In the bilingual high school, courses in French are offered to students in four streams, according to French ability. Since different texts are used in each, a few extra texts are needed for each stream rather than a few for the course as a whole. While the difference is not great, it does increase costs.

SUMMARY

The major parameters determining the costs of texts and supplies are type and number of different items, the cost per unit, the number of units necessary and the durability.

The selection of texts and materials for a program will depend on the content to be covered, whether these can be covered by a single text, and what supplementary materials will be needed. For example, both immersion taught in French and the regular program taught in English have a second language arts element for which materials are necessary. However, in the regular program where the second language is French with an emphasis on the student's abilities to speak the language, this element requires fewer materials than is the case in the immersion program where the second language element calls for reading and writing practice in the student's native tongue. Where

the approach to a subject calls for many projects, much supplementary material will increase costs, although some of these may be hidden in library budgets.

The number of units necessary will depend on whether a single 'teacher's copy' is all that is needed (often the case in oral French), whether sets are needed for groups in the class, or whether a set involves one for every member of the class. In the case of sets for groups, fewer total items are needed if sets can be used in rotation either by groups within a class or by groups from several classes. Such sharing will require planning and may be more difficult where materials are arranged in a sequence of difficulty or introduction of concepts.

Furthermore, there is an economy of simplicity in that the number of units necessary for a given enrolment is somewhat smaller where all students use the same material than where choice, involving the use of different materials, creates a number of sub-enrolments. In the latter case extra books are necessary to cover fluctuations in subgroup populations.

Durability depends on quality of materials and on amount of use. Poor bindings on immersion books may increase maintenance costs.

Costs per unit will depend on development costs of the materials, and on such things as bindings, number of illustrations and amount of colour used. Perhaps most important is the aspect of economies of scale. At present few immersion programs are being offered and so costs of developing and writing materials and set-up costs of printing must be divided among a relatively small number of copies. Where immersion classes can use material for francophones, the immersion program costs should be lowered by the economies of that (larger)

market, and will also benefit French schools by increasing the size of the market. However, the initial years of an immersion program (whether early or late immersion) demand special materials. Grants for developing and writing of curriculum for this specialized market might help to reduce costs of materials and make a wider range of materials available.

PART III: SYSTEM WIDE COSTS

Chapter Eight: Transportation Costs of Alternate Programs

This chapter will propose a method for estimating the cost of student transportation arising from the introduction of alternative programs. It will commence with a brief examination of the principal determinants of bussing cost, and then outline the empirical data required to estimate transportation costs of diverse options open to the planner of alternate programs.

DETERMINANTS OF COST

The determinants of cost may be divided, for our purpose, into two groups: those that pertain to the costs of operating busses (or other conveyances), and those that pertain to the convenience of the service.

The costs of operating busses may be considered (for our purpose) as fixed costs and variable costs. Variable costs, those which change with the distance travelled, are fuel and some maintenance. Fixed costs, those which are incurred by merely having a bus in operation, are salaries, depreciation, interest, insurance, licences, overhead, and administration. Drivers' salaries are the dominant item; together with the other constituents of fixed cost they will usually comprise over half and often over three-quarters of the total bussing cost. In addition, some maintenance costs, such as licensing inspections and and seasonal changeovers are at least partially fixed.

* Before preparing this chapter the authors had the opportunity of discussing transportation costs with Bryan Elwood and of reading his report to the Secretary of State (1976). We wish to acknowledge his help and thank him for some useful suggestions. The reader of this chapter and of Elwood's report will, of course, be aware of differences in approaches. In particular, there is a greater emphasis here on the rationalizing of board bussing policies.

Fixed Costs. Because such a large portion of operating costs are fixed, the establishment of each school bus route automatically incurs a set of inelastic yearly costs. Hence, the daily cost may be considered fixed. Whether the bus travels 25 or 150 km each school day and whether it is a 20 or 80 passenger bus will result in only marginal changes in the cost of its operation on any school day. Whether the bus carries 8 or 80 students will matter scarcely a whit.*

The foregoing presumes the school board operates its own busses. If the board contracts for its busses, it is still practical to regard the cost of each bus as a fixed daily one. Naturally, some boards may find it practical to contract for student lift in other forms than school busses; in these cases the daily 'per bus' cost concept may not be useful. For example, if students are provided bus tickets, the cost per student is fixed.** Taxis and similar conveyances may also be considered individually. The exceptions aside, it should be clear that if a school bus is used to transport children, the cost of operating that bus is essentially fixed for the year; the school board incurs cost *per bus*, not per student or per kilometer.

It follows that the board seeking to minimize student transportation costs will seek to minimize the number of vehicles employed. The number of routes needed by a board will be a function of the 'going' and of 'convenience of service' parameters.

* Elwood (1976) indicates that a bus must travel some 50,000 miles per year, or roughly four to five times the typical yearly school bus route mileage, before operating costs equal 'set-up' costs (depreciation on vehicle, interest, driver's wages, insurance and licenses).

** Note, however, that some of the convenience of service parameters, e.g., eligibility, discussed below will apply to these costs as well as to bus costs.

The 'Going'. The 'going' is the effect of the terrain, traffic conditions, and climate on the bus's progress. A bus travelling on country roads with stops for cross-roads 2 km or more apart can average a greater speed than one negotiating urban streets with stop signs at every block. One travelling on straight, level highways can go faster than one on hilly, twisting roads. The board can exercise little control over the going, although it might influence such things as the priority of snow removal. Because the going constrains the average speed of the bus, it can be an important cost determinant by limiting the number of students picked up or the distance travelled during the time available for bussing, and hence influencing the number of busses required to transport a given number of students.

CONVENIENCE OF SERVICE

The convenience of service parameters relate the demands made upon the student using the bus, that is, how far he might walk to the bus or how long he might ride.

Student eligibility for transportation can have a dramatic effect on cost. If no one is eligible, there will be no dollar costs for busses, but there may be hidden costs (such as lost grants because of absences) or political costs. Several types of eligibility criteria may be employed by boards. The simplest, and probably the most common, is to define an (arbitrary) maximum walking distance; students living beyond that distance are eligible for transportation. Although the maximum walking distance may be conveniently depicted as a radius, the students are constrained to follow the existing network of sidewalks and pathways, making the area from which the children walk somewhat smaller than the ideal circle. Another technique is to define eligibility in terms of some natural or artificial boundary; 'all students

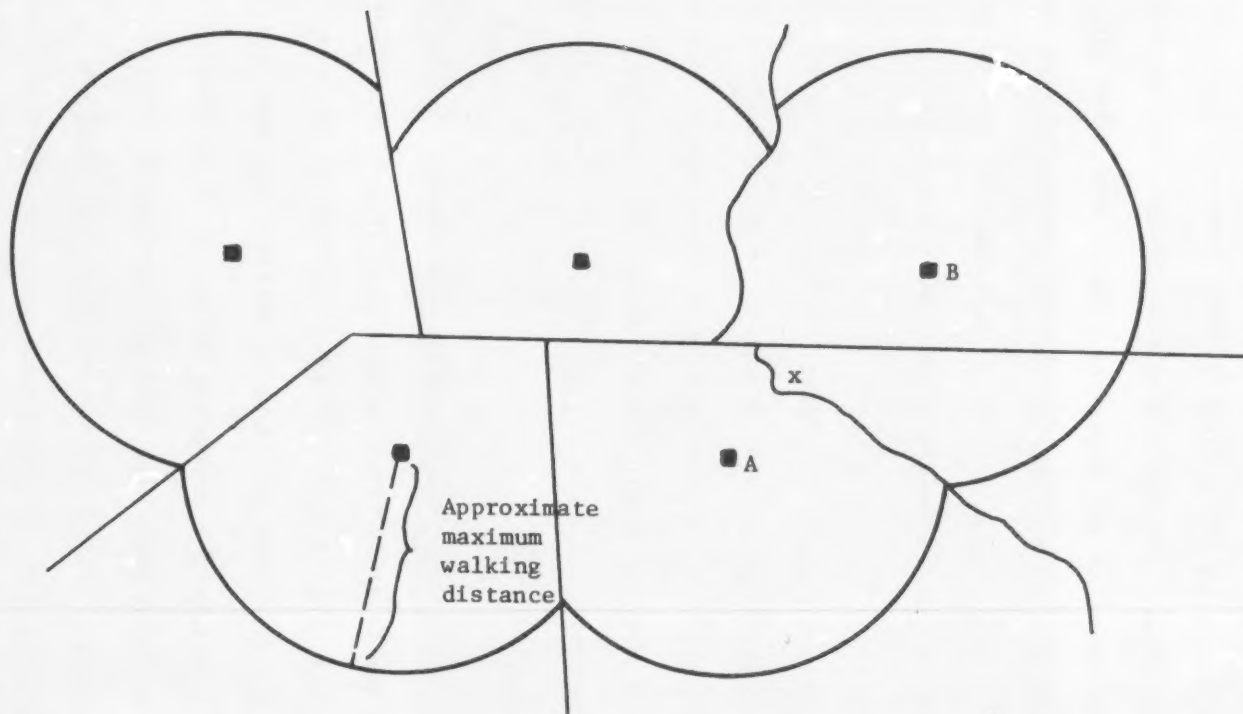
south of Baseline Road' or, perhaps more commonly, 'all students beyond the village limits.'

In some areas schools, 'neighbourhood schools', may be associated with traditional sending areas (Figure IV) within which children walk; any child attending a school outside his home area (for diverse reasons) may be deemed eligible. However, if this eligibility is not also tied to a maximum walking distance, a child may become eligible for transportation to a school closer to home than the neighbourhood school to which he formerly walked. (E.g., A child living at x is closer to school A than to his own 'neighbourhood' school B.)

Handicapped children (crippled, blind, retarded) may be eligible for transportation irrespective of other criteria.

Time Envelope. Another student convenience parameter is the maximum amount of time which can be allowed for transporting students -- the time envelope from first pick-up to school opening in the morning and from school closing to last drop-off in the afternoon. The earliest time of pick-up is typically 60 to 90 minutes before the first class. The role of this time envelope (Figure Va) as seen by the transportation planner is quite plain -- *ceteris paribus*, more time permits more students to be transported per bus, either by filling more seats, by making more stops, or by taking additional loads. As a parameter for the education of students, the role of this time envelope is more complex; it may provide valued contact with friends and time to engage in games before school or it may result in disrupted morning family routine, missed breakfasts, and a depressing ride on the bus. Although some of these educational effects might be affected by school policies, these student or educational disadvantages or benefits will not be explored here.

FIGURE IV



Traditional school sending areas bounded
by main streets with an approximate
maximum walking distance depicted

Maximum student walking distance to the bus is the third important student convenience parameter. As will be demonstrated, it can have a profound effect upon the cost of student transportation, particularly in built up areas. The maximum walking distance may be defined in terms of distance, as 400 meters or 1 km or some other arbitrary measure such as to the (farm) gate. One expects to find walking distances to the bus pickup less than the distances for students who walk to school, as the bussed student must spend additional time riding to school.

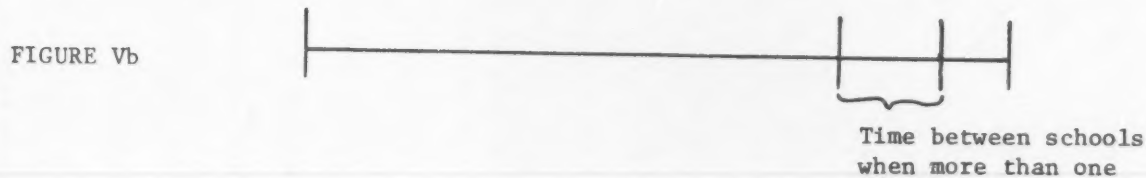
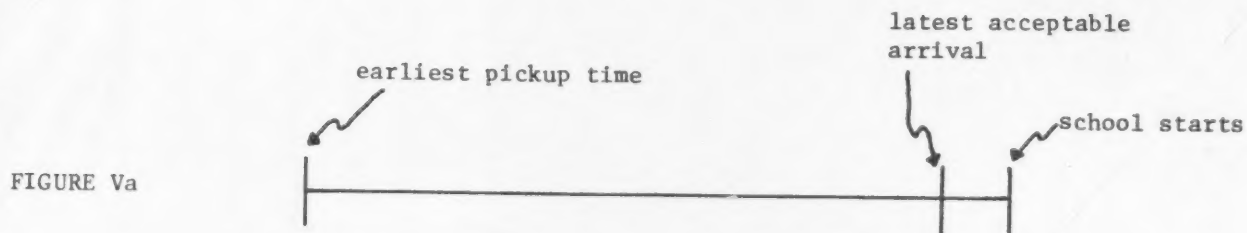
Another convenience parameter has to do with the composition of students on the bus. In some instances primary immersion students and high school students are transported on the same bus from a regular elementary school to a more distant secondary school and immersion centre. In other cases the large age span presents difficulties and separate runs are made.

DETERMINING ROUTES NEEDED

In order to apply these determinants to cost of transporting students, one recalls that cost is a function of the number of busses. Hence to minimize cost one seeks to minimize the number of busses employed. Convenience parameters affect costs by changing the efficiency with which busses can pick up students and, therefore, the number of busses needed for a given number of students.

Transportation officers report that, as an average, the duration of a stop for picking up children is only slightly influenced by the number who get on (or off). Most of the time involved is required to slow the bus, wait for the children to approach and get on, and open and close the doors. Call this average pickup duration D.

A School Transportation Time Line



Bussing Time Envelope, T

When the concept of 'going' was introduced it was suggested that for any type of going a normal or usual bus speed might be identified. It appears that three to five such 'goings' (hence three to five 'usual' speeds) might be adequate to describe an average bus speed for our purpose. Call the average speed S .

Given the finite bussing time envelope, T , between the earliest pickup and the desired arrival at school, then a relationship of the form

$$T = \frac{R}{S} + nD$$

where R is the route length and n is the number of pickup stops, describes the relationship between the average speed, the route length and the number of stops.* For any route S , D , and T are not variables, and these parameters determine the length of the route and the number of stops it may contain.

However, this relationship does not describe how many students are transported; one child may get on at each of a dozen stops, or a dozen children may get on at each stop. The number of busses (and hence the cost of school bussing) will be determined by how many children can be picked up on a route of length R with n stops. Therefore, the crucial relationship is that between route length and number of stops, on the one hand, and the number of children who can be picked up, on the other hand.

Maximum student walking distance between home and bus is the major convenience parameter determining the number of students who can be picked up at stop n . It is especially important in built up or sub-urban areas. A series of diagrams, Figures VI through XI, illustrate

* Since most routes will be made up of segments of different goings, $\frac{R}{S}$ is really the sum of these segments. That is, $\frac{R}{S} = \sum_{i=1}^m \frac{R_i}{S_i}$ for m convenient segments. When the bus picks up two loads of children, factor $\frac{R}{S}$ includes both trips.

possible route designs for different maximum student walking distances. Note that as the walking distance becomes *smaller*, *fewer* students will be picked up at each stop, and both the total length of the route (or routes) to be travelled becomes longer and the stops more numerous. The principle is similar to clearing a parking lot of snow. A small plow clears a smaller swath and so must make more sweeps than a larger plow to do the whole job.

Although the diagrams depict a modern subdivision with loops and curved streets, similar results may be obtained for more traditional rectilinear street patterns. Certain limitations to these diagrams should be noted. The route designs are based only on the map; foot paths, if they exist, could produce economies. A skilled route planner could undoubtedly produce a more efficient plan, and it has been assumed that children live in the least convenient locations (the farthest house on each street contains an eligible child).

It can be seen that the effect of student walking distance upon the possible route designs can be dramatic. If one considers that each of the illustrated route designs service the same number of children, and keeps in mind that a bus may be filled more than once if it has time, the importance of rational assessment of this parameter becomes apparent.

The walking distance transforms the density of the eligible student population over the area to a linear density along the bus route, that is, the number of students per route kilometer. This relationship allows one to say 'if we have X eligible students in an area and the maximum walking distance is Y meters, then there will be Z students per kilometer at V stops along W kilometers of bus route' with reasonable assurance. One might then estimate, knowing the time, going, and

FIGURE VI

A SUBURBAN AREA

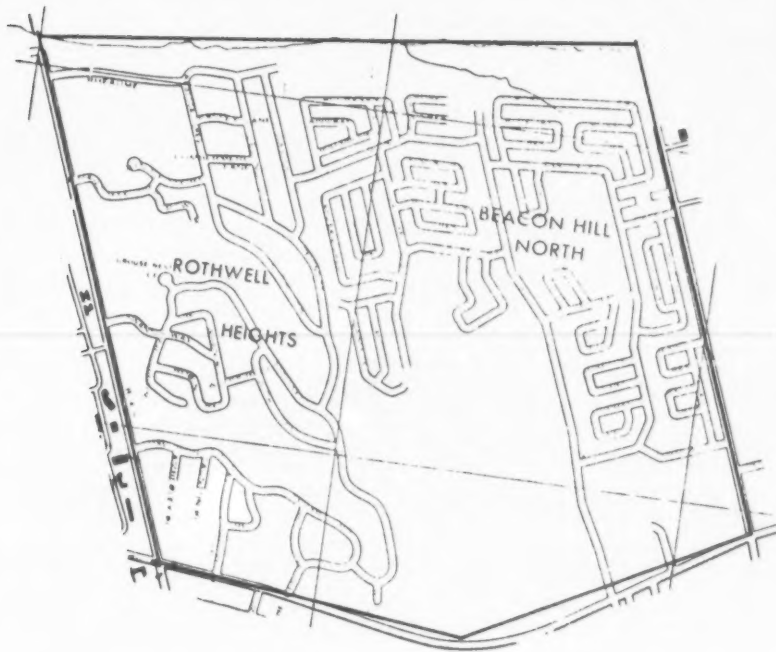
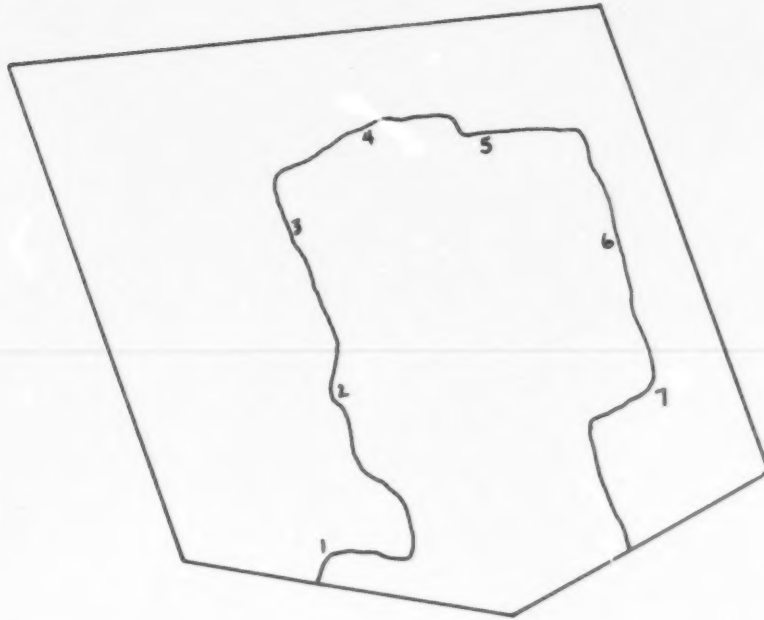


FIGURE VII

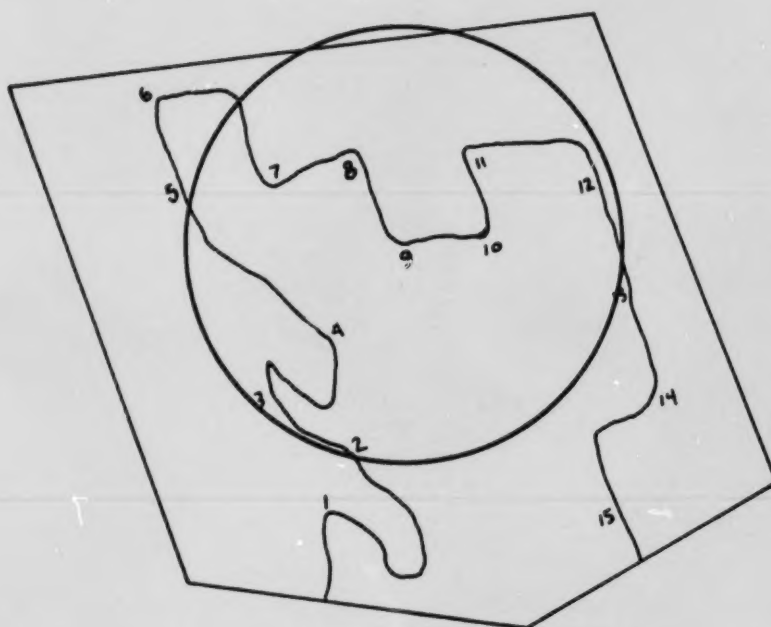
BUS ROUTING WITH PICKUP POINTS NUMBERED



Maximum walking distance 1 km (5/8 mi).
Route length: 5 km, 7 stops.

FIGURE VIII

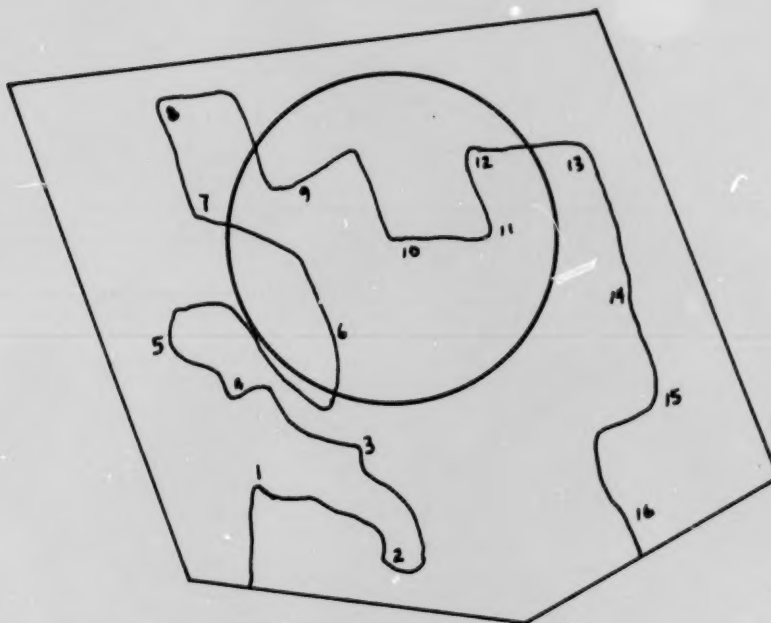
BUS ROUTING WITH PICKUP POINTS NUMBERED



Maximum walking distance 800 M ($\frac{1}{2}$ mi.)
Route length: 7.9 km; 15 stops.
(Circle drawn with 800 M radius)

FIGURE IX

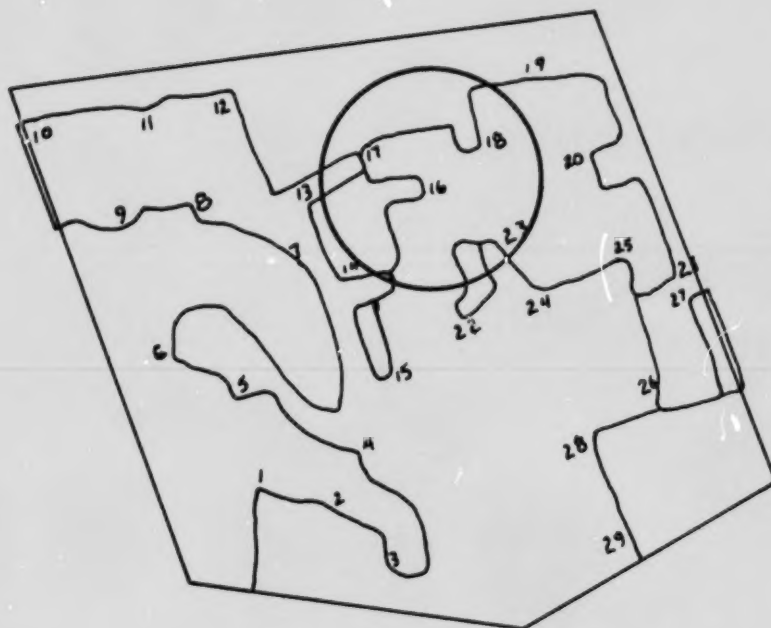
BUS ROUTING WITH PICKUP POINTS NUMBERED



Maximum walking distance 600 M ($3/8$ mi).
Route length: 9 km; 16 stops.
(Circle drawn with 600 M radius)

FIGURE X

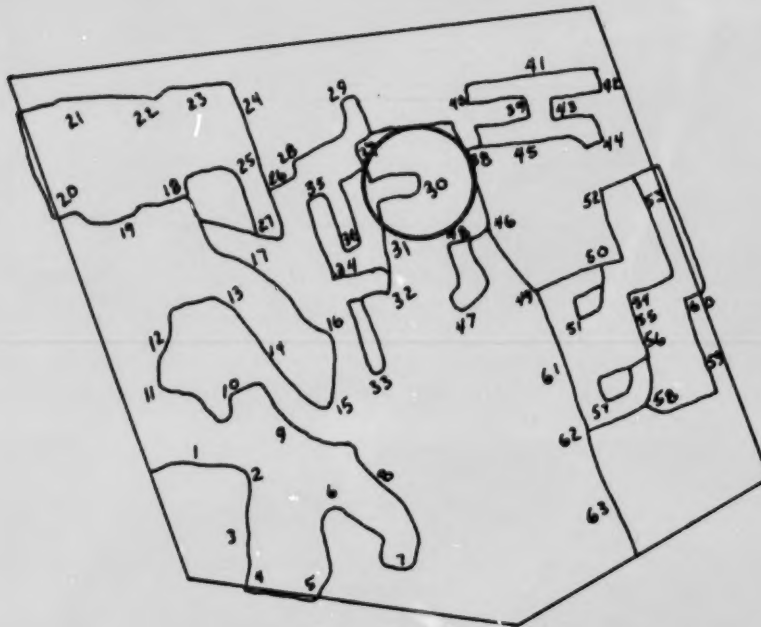
BUS ROUTING WITH PICKUP POINTS NUMBERED



Maximum walking distance 400 M ($\frac{1}{4}$ mi)
Route length: 17.8 km; 29 stops.
(Circle drawn with 400 M radius)

FIGURE XI

BUS ROUTING WITH PICKUP POINTS NUMBERED



Maximum walking distance 200 M (1/8 mi)
Route length: 23.8 km; 63 stops.
(Circle drawn with 200 M radius)

distance relationship for the number of students to be picked up, the number of busses and hence the cost of transporting students from any particular area to any particular school.

BUSSING TO ALTERNATE PROGRAMS

This analysis may now be turned to the specific problem of estimating student transportation costs in the implementation of alternate school programs. The planner has options which will affect transportation costs when contemplating the introduction of alternate programs. These options are of two types: those which establish the convenience of service rules, and those which relate to program location. Although the importance of convenience of service values to transportation costs has already been discussed, an example may be in order. When the immersion program was initiated in kindergarten at one board, the decision was made to provide bussing for any immersion student who had to attend a school other than his neighbourhood school. Students in the regular program were eligible for bussing only if they lived more than a mile from school. Had the mile rule held for immersion students, about 20% of those bussed would walk and a similar number could walk to another immersion school, thus eliminating about eight bus runs.

The location of alternate programs will also affect the amount of bussing necessary. The alternate program may be established at every school; this option will not introduce any additional student transportation costs as students remain in attendance at their current school. However, enrolments in each program at each school may be small, resulting in small classes with high per student costs, or space may not be available. The new program may be established at selected

schools, possibly displacing the current occupants. As student transportation costs will, in most cases, arise from this option, it is the premise of the following considerations.

If there are currently no students transported, then the establishment of an alternate program at one (or more) schools will produce a population of students who may require transportation, whether or not 'regular' program children are displaced. If the board elects to transport students, either those attending the alternate program out of their neighbourhood or students who have been 'displaced', then the cost of this transportation may be estimated by applying the analysis previously introduced; all transportation costs arise from the alternate programs.

If some children are currently being transported, then cost analysis can proceed in two steps.

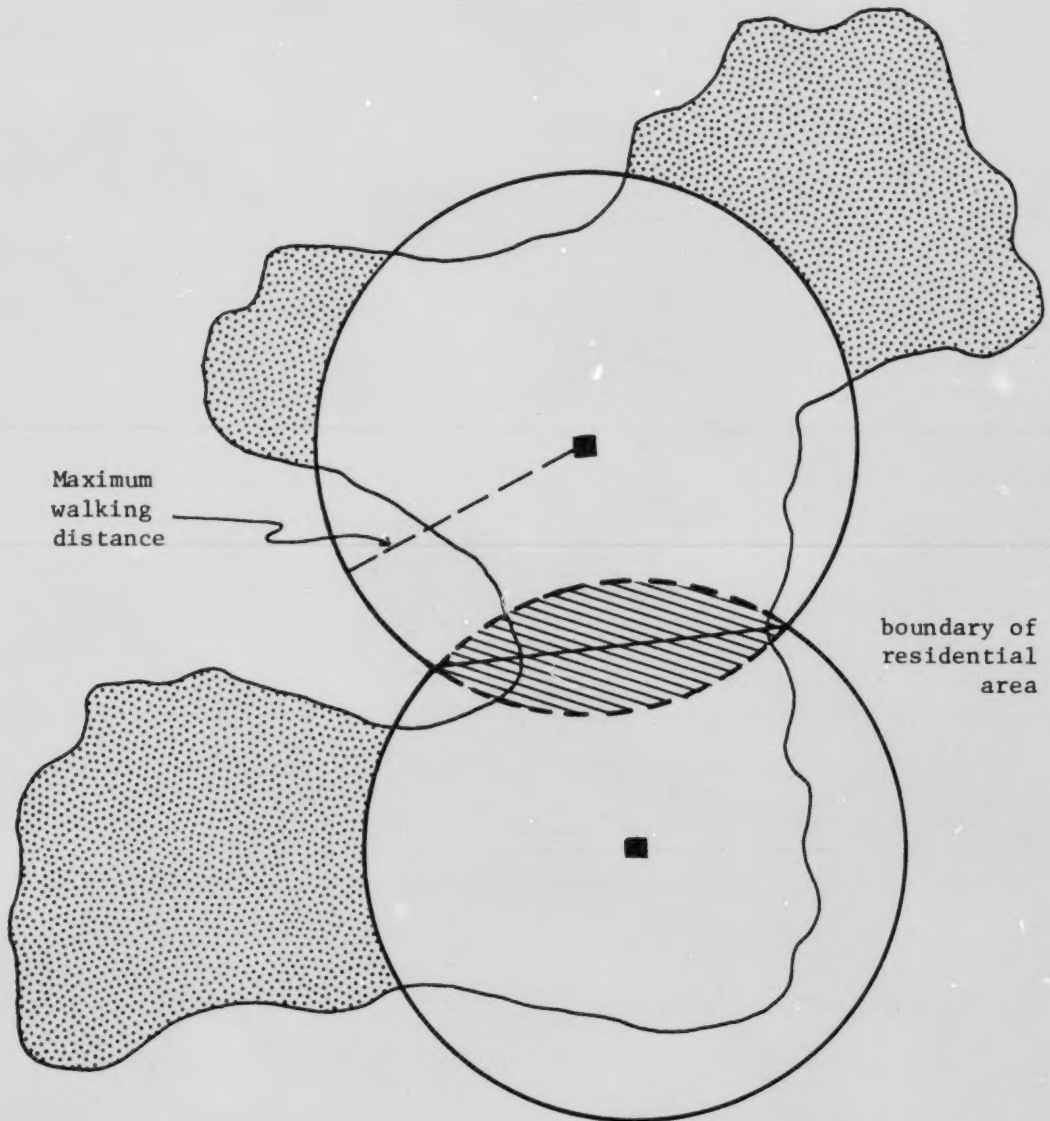
The alternate program will create an eligible population larger than that previously transported and divisible into two groups: alternate and standard program students, both with different destinations. Because each bus route operating in a sending area will generate a full route cost, sending areas should be covered only once. The real effect in areas currently experiencing bussing will be a reduction of the bussing time envelope by an amount equal to the travel time between the standard and alternate program locations (see Figure Vb). The resultant cost increase results from the fact that less time means that fewer students can be picked up on a run and, therefore, more busses may be needed to transport the students. This increase may be estimated and is the incremental transportation cost resulting from the alternate program. However, if the time envelope can be increased to cover the extra time, variable costs from the increased mileage between schools will be the only incremental cost.

Transportation in 'virgin' sending areas will usually have one destination only, and its cost may be estimated to complete the estimate of transportation cost of the alternate program. This point is illustrated on Figure XII, where a populated area is outlined. Originally, two neighbourhood schools with the same programs served this area. All children living within the two circles walked to their neighbourhood schools and busses were provided only for students living in the stippled area. When different programs are offered at these two schools, only children living in the hatched area will need no bussing. Children living in the stippled area will still be bussed, but some will now attend each school. Busses serving these areas will drop some students at the neighbourhood school and then proceed to the alternate school with the remainder of the students. The time envelope for picking up students from these areas will be shortened by the time the bus takes to travel between schools. In addition, bussing may have to be provided for students living in the untextured areas who attend the program not offered in their neighbourhood school. Busses picking up children in these 'virgin' areas will have only a single destination, that of the alternate school. In the actual case, of course, route patterns would likely be altered so that a single bus would serve both types of areas.

While the present analysis has been developed in response to its applicability to the introduction of French immersion in schools, its applicability to any alternate program has been stressed. Application to the separate schools, by considering them as alternates within this context, might prove instructive.

FIGURE XII

Distribution of Student Population
around two schools



SUMMARY

In this discussion of transportation costs dollar figures have not been presented. Dollar costs increase from year to year and are usually presented either as a total or on a per pupil, or per pupil-mile, basis. One of the boards in the study is rural and transporting pupils has always been necessary. The other board is urban and few pupils live beyond neighbourhood sending areas. In the first case the incremental costs for transportation to immersion are relatively small and difficult to sort out, because routings have been changed to accommodate immersion with minimum costs. In the second case most transportation costs are related to the alternative program, but these services, because they are available, are also used by some other students. These students reduce the per pupil costs, but make changes in the convenience parameters more difficult.

The discussion of transportation costs has emphasized the fact that most of the costs are incurred on a *per bus route* basis, rather than on a per pupil basis. The board policies determining who is eligible for any transportation, how close to their front door they may expect to be picked up, and how long students can be expected to travel to school will have large effects in determining the number of bus routes. Of course, it is true, as Elwood (1976) has stated, that these are politically sensitive issues, but it does not follow that the options of a board are closed. Particularly when alternative programs are introduced and policy formulated these parameters may be rationally considered.

Chapter Nine: Curriculum Development

The task of the schools is the transfer of skills, information, values and understanding to the children who are its students. Curriculum or pedagogical packages assist the teacher, providing a method (or methods) and materials for getting this knowledge across to the students, into their mind. These packages are the fundamental tools, the intellectual capital, which the teacher uses (with more or less skill) to produce learning in students. They can be likened to the machinery of a manufacturing plant which workers use to turn out the product. The quality and content of the pedagogical package, combined with the skill of the teacher in using them, are probably the crucial factors in determining the quality and quantity of the learning. They are probably more important to the schools than such tangible capital goods as buildings and school furniture.

This is not to say, however, that elaborate packages, or packages that dictate particular teaching methods, are necessarily the best. At present too little is known about learning, especially the long-range, extensive comprehension of subject matters with which schools are concerned, to allow us to know what works best. It is likely that no one package will ever be developed that is best for all teachers and all students. In any case, the evaluation of curriculum packages was beyond the scope of this research, although some comments made to us about quality will be mentioned at the end of this chapter. We have attempted to provide some idea of how complete or how 'full' the various curriculum packages are, so that their costs can be considered in relation to the amount of material provided. Initially, three categories were specified: whether there was a curriculum -- that is, a detailed outline

of the content to be taught and the sequence in which it is to be taught; whether there were materials for use by the teacher in presenting the subject, including description of methodology and evaluation instruments; and whether there were materials -- readings, seat work, etc. -- for the students to use. In actuality, materials for teachers and for students were not often distinct categories. To the extent it was available, information concerning completeness of programs has been indicated along with the costs.

In 1973 the Ottawa and Carleton Boards of Education initiated new programs, such as late entry immersion and extended French, and expanded others, such as core and early entry immersion. These new and expanded programs required pedagogical materials which, because of their experimental nature, were not available elsewhere. Curriculum packages have had to be developed locally to fit the program aims, the time available and local conditions.

Although each board either had or hired a strong team of consultants (also called resource teachers or special advisory teachers) headed by a coordinator to assist teachers in developing the content and methodology of these courses, much of the burden in the first year or two fell to the classroom teacher. In the following years, boards settled down to develop pedagogical packages, which include curriculum guidelines, resource materials, ideas and plans for student exercises, projects, and evaluative materials. In a well-developed curriculum package these are organized into a learning sequence or subject themes.

In this chapter the procedures used to develop some of these pedagogical packages will be described and the cost indicated. Two cautions should be kept in mind while reading this material. First, the packages available to different programs vary widely as regards their completeness or comprehensiveness. Some consist, even now, of little more than

statements of aims and a curriculum guide. Others are collections of materials from classroom teachers and other sources, with little pedagogical organization other than by topic. Still other packages have been carefully thought through so that detailed instructions for the teacher and materials for student use are related to a sequence of objectives. It should also be noted that both boards have spent money on material that turned out to be unsuitable. It is very likely that such aborted efforts are an inherent part of any creative effort such as developing curricula and pedagogical materials.

A second problem with this material is that the data shown in the following tables are not complete and not uniform across programs. Curriculum development is an integral part of the job of consultants at both boards. They usually work on more than one curriculum and are also involved in advising teachers in the classroom. They are seldom able to give estimates of the amount of time spent on each of these activities, especially for years prior to 1976-77. Some of the cost tables that follow indicate only that a consultant has been involved, but not the time spent by this person. The cost shown, therefore, may include only the time of teachers working on a specific package for a specific period. The contribution of consultants would usually include their salary for the days or weeks when the team of teachers are present, plus the time spent thinking through the curriculum content and preparing for the team. Time to edit the package is sometimes formally indicated, but for other packages this task was done as other work allowed with no specific time set aside for the work. Activities of the various consultants are indicated at the end of this chapter, in Tables 78 and 79, so that the reader may estimate the proportion of their time spent on curriculum development. Note that in addition to these consultants, both boards employed a coordinator who

was responsible for the overall implementation of French programs throughout the board.

However, consultants are not the only source of inaccuracy on the cost tables. Supplies were often purchased for the consultants' offices and used as needed for various projects. The cost figures here usually include only supplies especially purchased for a specific curriculum project, and not the general purchases. Therefore, it is probably low. Typing, too, was done on a pool basis in some cases. Generally, when a typist's cost is shown for a package, the typist worked for that time as part of the team during the writing.

While some of the information shown here comes from records made at the time, much of it comes from informants and is subject to the vagaries common to all retrospective interview data.

The costs of pedagogical packages were gathered by looking at the programs and asking, 'What was developed by whom, when?' From this information about personnel, we worked back to salary costs and added in the costs of supplies. In some cases only recent figures (1976-77) are given, but the degree to which these are typical is indicated. For each board the general procedures are discussed and then each program is considered. In the summary, the cost parameters are delineated.

OTTAWA CURRICULUM DEVELOPMENT

There are some similarities between the two boards in the way curriculum materials are developed. Both the Ottawa and Carleton Boards usually hire teachers with experience in teaching the program to do the writing of the materials. Consultants guide the teams of teachers and act as the final editors and distributors. Prior to 1975, consultants did all the editing, but this has changed. Ottawa now hires a second team of teachers to do the major editing of the work of the teacher-writers.

In Ottawa the bulk of the curriculum material writing is done by teams of teachers seconded from their classrooms during May or June, and the programs are ready for use the following September. Prior to the formation of the teams, the consultants have reviewed the curriculum being taught, examined relevant resource material, and outlined the aims and sequencing of material in some detail. The skills most wanted from the teachers are their abilities to design projects, exercises and activities that are suitable for children at a given grade level. The teams of teachers work together with the consultants and a typist, contributing ideas and writing the copy that is then edited by a second, smaller team of teachers.

There seem to be no problems in taking experienced teachers from the classroom late in the school year, since most of the curriculum has already been covered, and the substitute can cover the remainder.

Basic French in Ottawa

Ottawa had introduced a longer 40-minute per day time period for basic French to the cohort which began kindergarten in 1971. A new curriculum was required as these students entered each new grade level. The board had to develop its own curriculum because published programs for these grades tend to be written for a 20-minute period. This was done one grade a year for the leading cohort.

When additional funds were available in 1973, a decision was made to increase the grade 7 and 8 basic French to 40 minutes a day immediately, and a curriculum with materials was written for these grades. However, it was designed for students who had had 40 minutes per day in the preceding grades, so that until the 1971 kindergarten cohort reaches grade 7 (1978) materials have had to be adapted for students with less experience in French.

Students in cohorts entering school before 1971 carried on with the old 20-minute period through the grades. However, in 1976 the 40 minutes of basic French were initiated at both the grade 5 and 6 levels. Five was the leading edge, so a curriculum package was ready for them as planned, but the grade 6 classes, beginning a year ahead of schedule, had no new curriculum.

The materials developed each year for the basic French program are indicated in Table 64.

The grade 6 pedagogical package provides an example of the regular procedures used by the Ottawa Board of Education for basic French curriculum development at each grade level. This package is divided into 10 modules, one for each month. The first reviews areas covered in earlier grades, and later modules focus on cultural themes such as francophones in the world, French recipes, traditions, poems and songs. One module examines newspapers and other communication media. As is the case in the grade 5 program (but unlike earlier grades), the grade 6 program encourages children to talk spontaneously about the theme *before* the structured material is presented. Tapes, flashcards and exercise books have been developed and published readers have been purchased to add to the total package.

Development of the package began with a meeting of the teachers who would write it and the consultant and superintendent for half a day. Teachers' comments about the previous package were reviewed, resource materials examined, and plans for the new work outlined. Then the teachers spent eight weeks writing the materials, working with the consultant in a large room at a centre town school. Teachers produced projects, lessons, activities, tapes, reinforcements, reviews and evaluations along the theme ideas planned earlier by the consultants.

TABLE 64

OTTAWA BASIC FRENCH: SCHEDULE OF CURRICULUM DEVELOPMENT

Grade	Minutes per week	Description
2	200	<u>1973</u> A curriculum (family theme) with materials, stencils (300 pages). More materials needed. To be revised in 1977.
7-8	200	Curriculum guidelines, methodology, complete.
K	150	<u>1974</u> A curriculum with more materials than needed, organized in themes, 100 word vocabulary.
3	200	Curriculum (community and family themes), methods, materials, exercise books, pictures, flashcards, review, reinforcement suggestions.
K-3	200	<u>1975</u> 30 themes in various subject areas, teacher's guide and student materials. (Also used for immersion to teach phonics.)
1	200	Revision of 1972 curriculum - very explicit, practical methods, themes. Comprehensive: 600 flashcards, stories, dialogues, stencils.
4	200	Curriculum (regional themes) and complete sections. Story, phonics, language, reviews, workbooks, listening centre (20 tapes). Mostly review and consolidation year.
5	200	<u>1976</u> Curriculum. (New aim: to have students initiate sentence structures rather than repeat after teacher. Reading and grammar introduced.) Complete package.
9-13	200	General curriculum guideline for teachers.
6	200	<u>1977</u> Curriculum (strongly cultural) and complete sections. Story, phonics, languages, review, workbooks, tapes, readers, games, songs, poems, recipes.

Materials from the old 20-minute program may be revised to suit the student with more French experience and included with the new material. Besides general aims and lesson plans and ideas, the teachers' manual includes a description of tape contents and answers to exercises and tests contained on the tapes.

The consultant works closely with the group and in this case is editor. The typist works with the teachers for seven weeks so that teachers can participate in decisions about format design or handwriting interpretation. The concurrent typing also ensures that the program is ready for duplication and circulation to classrooms by the fall. The reviser organizes materials and does preliminary editing.

The costs of this work are shown in Table 65. The cassettes indicated in the table are used for the original taping by the teachers. These costs do not include the copies sent to classrooms. The salaries of consultants or superintendents are not included in the table. The costs given for teachers is that of the substitutes hired to teach their classes.

TABLE 65

OTTAWA BASIC FRENCH: COST OF GRADE SIX CURRICULUM PACKAGE,
SPRING, 1977

Phase	Staff	Total Days	Cost Per Day	Total Cost
Planning	4 teachers	2	51.38 ^a	103.
Development	3 teachers	120	51.38 ^a	6166.
	1 typist	35	35.00	1225.
	1 reviser	3	48.06	144.
	1 editor			300.
	1 artist			150.
	cassettes			50.
	reference			
	materials			150.
Total				8288.

a. This amount is the per diem rate for substitute teachers.

This general pattern of curriculum development was followed for all the elementary 40-minute basic French programs in Ottawa, as they were developed one a year for the leading cohort. Because the use of personnel was similar for the programs for grades 1 to 5, one may expect that costs were also similar, allowing, of course, for inflation. The basic grade 7 and 8 program package was written by three teachers, one of whom is a secondary school French teacher. Information about the costs of writing this material was not well-documented. The curriculum guidelines for basic French in grades 9 to 13 were written by a consultant working alone.

Ottawa's Early Entry Immersion

By 1973 the first early entry immersion classes had reached grade 3 level. As this leading edge progressed through the grades, a curriculum and program materials were needed for all subjects, including French. Because the French immersion program was experimental, few published materials were available. English curricula were translated, as were some materials, and some francophone materials were also available or could be adapted. Much daily preparation on the part of the teacher was required. However, a body of curriculum material is being built up, much of it developed in tandem with new material for the regular program. Table 66 indicates the material that has been developed for the immersion programs since 1973.

The procedures used to develop the junior science pedagogical package evolved from the Ottawa board's experience with various curriculum development methods and will be used again in future work. Therefore, their cost is probably typical of curriculum development for early immersion. The package was developed by teams who work together to prepare parallel programs in French and English. The programs are not translations of one another, but result from having

a French and an English teacher working from the same plan at the same time in the same place. The same illustrations are used for both programs.

The pedagogical packages consist of 16 units, each containing enough material (six lessons and a review and evaluation section) for one month of 90 minutes per week science instruction. Booklets are colour coded according to grade level and drawings have standardized labelling. However, texts, science kits and most books and films listed for reference are in English. Immersion teachers using the kits from the science department must change labels on the materials in the kits to French. Individual units are intended to be self-sufficient and adequate for teachers whether or not they have a science background. They are based on science guidelines and have been checked to see that recommended activities are safe and that procedures will not create classroom problems.

A team of a consultant and an immersion and a regular program teacher prepares about one-and-a-half units a week. In the spring of 1976, two such teams worked for five weeks. Teachers are seconded from their classrooms and replaced by substitutes, who account for the salary costs of teachers. Before the teachers begin work, consultants outline the content to be covered by each unit, the format and the approximate length. Because of this preparation, the teacher team needs a relatively short time to develop and describe instructional activities suitable to both the material and the grade, and to write this material. Their unique contribution is their knowledge of activities and techniques that work well in the classroom. Each teacher writes an entire unit in his own language, thus keeping the natural flow of each native tongue. They share ideas for activities and presentation. Once the units are prepared, two other teachers edit the materials. The costs of this work are indicated in Table 67.

TABLE 56

OTTAWA FRENCH IMMERSION*: SCHEDULE OF CURRICULUM DEVELOPMENT

Grade	Program	Description
<u>1973</u>		
6	Late	Curriculum only (based on English program), new curriculum for language learning, and some materials, e.g. listening centres and workbooks.
<u>1974</u>		
K-3	Early	Language arts, listening centre materials (contract).
K-1	Early	Program revision.
7-8	Late	Language arts, listening centre materials (contract).
<u>1975</u>		
1-3	Early	24 social studies units, curriculum and student materials.
K-3	Early	30 theme units to teach phonics, includes teacher's guide and student materials. (Also used by Basic French to learn phonics by repetition.)
K-8	Both	Regular program curriculum. Guidelines translated.
6	Late	Reading program, guidelines and some lesson material, (emphasizing four skills - reading, listening, speaking, writing).
K-6	Early	Health, curriculum and student materials (not circulated yet).
6-8	Late	Linguistic skills objectives, and methodology, revised to adjust to longer core program.
<u>1976</u>		
K-3	Early	16 science units: curriculum and student materials, also used by Basic French.
4-6	Both	16 science units: curriculum and student materials, complete, includes a core of compulsory units plus some non-compulsory units. Little teacher planning required. Kits available in English only.

(continued)

TABLE 66 - continued

Grade	Program	Description
4-6	Both	Social studies units: curriculum and some materials and 100 half-hour listening tapes. Work was begun in 1975.
7	Early	Revision of 7 guidelines.
8	Early	Curriculum guidelines, linguistic objectives for lead class at Rockcliffe.

* The leading edge of early entry immersion was in grade 3 in 1973 and progressed to grade 6 in 1976. Late entry immersion was planned to have a child take full immersion in grade 6 and half-day in French in grades 7 and 8. However, all grades were started at once in 1973 at two schools, and in 1974 at four other schools.

TABLE 67

OTTAWA EARLY ENTRY IMMERSION AND REGULAR PROGRAMS: COST OF
16 JUNIOR SCIENCE PEDAGOGICAL PACKAGE UNITS, 1976

Phase	Staff	Total Days	Cost Per Day	Total Cost
Writing	2 consultants	50		
	4 teachers	100	51.38 ^a	5138.
	2 typists	50	35.00	1750.
Editing	4 teachers	15	51.38 ^a	771.
	reference materials	--	--	50.
Total				7709. ^{a b}
French Immersion Share: (One-half of Total)				3854.

a. Cost of substitute teachers.

b. Not included is the cost of art work, paid at the rate of \$2 per sheet to illustrate each unit.

Other early entry packages have been developed. Primary science, health and social studies units were written by teams, although not all were developed simultaneously in two languages. In 1976 the primary science team developed only 16 of a planned 24 units because work was delayed waiting for the budget to be passed. Their budget was \$6,000, which was also to include finishing social studies units begun the year before at a budget of \$3,000. Information about packages developed under contract by individual teachers was not well-documented.

The costs of revising the early entry grade 7 curriculum guide for the second cohort, and developing the grade 8 outline for the lead cohort are shown in Table 68. A single teacher worked under the guidance of the intermediate French immersion consultant in preparing this material. A substitute replaced her in the classroom. The amount spent on reference materials is for copies of sample materials.

TABLE 68

OTTAWA EARLY ENTRY IMMERSION: COST OF GRADE 7 AND 8 CURRICULUM GUIDELINES FOR FIRST TWO COHORTS, 1976

Staff	Total Days	Cost Per Day	Total Cost
1 teacher	15.5	51.38 ^a	796.
Resources			150.
1 typist	3.0	35.00	<u>105.</u>
Total			1051.

a. Cost of substitute teacher.

Late Entry Immersion in Ottawa

The late entry immersion program was envisaged to have a student take a full day of French in grade 6, followed by half-days in grades 7 and 8. However, in 1973 and 1974 all three grades were introduced at once in a school. Therefore, for the first three years that a late entry program was in a school, classes entering grade 8 would come with different amounts of French -- that is, coming in with only the 20-minute basic French in the first year, and in the second year entering after having had the 50 per cent program in grade 7, and only by the third year having had the full program from grade 6. For one year the grade 7 teachers faced students without the grade 6 part of the program. Thus the curriculum for these grades has had to change as the earlier cohorts with less French pass through. Perhaps for this reason most of the formal curriculum development in 1973 focussed on grade 6. For all grades in the early years of the program, consultants tried to supply published materials for teachers to use as resources and acted as clearing houses for exchange of teacher-prepared materials. However, teachers used the English curricula and spent hours translating and planning their own material.

The amount of curriculum material did increase gradually and recent developments have added to the store (Table 66). Listening centres for the initial grade 6 classes were developed in 1973. This work was shared by the consultant with a teacher from another board (who was paid by receiving enough copies of the material developed for use in her class). Editing was done by exchanging sections by mail. A language arts guide and materials were prepared under contract by a single teacher in 1974, but the material was considered inappropriate and was not circulated. In 1975, a teacher worked with the consultant and produced intermediate linguistic guidelines.

Late entry immersion curriculum development up to 1975 was done by teachers outside of school hours, for which they were paid a lump sum for the job (as indicated in Table 69). Since then, substitute teachers have been hired so that teachers could do developmental work during the school year. Because work was not organized into a specific time frame and because the teachers interviewed had worked as time from other duties permitted, the costs of this curriculum development are difficult to determine with any degree of accuracy. For instance, teachers were probably not fully compensated for overtime under the lump sum payments.

TABLE 69

OTTAWA LATE ENTRY IMMERSION: COST OF CURRICULUM MATERIALS
DEVELOPMENT, 1973-1976

Year	Level	Project	Staff	Cost
1973	6	French language materials and some social studies units	1 consultant 1 teacher from another board	-- a.
	6	Curriculum guidelines	1 teacher	600.
1974	7-8	Language arts guide and materials	1 teacher	N.A.
1975	6	Reading curriculum	1 teacher	500.
	6-8	Revision of linguistic objectives and methodology	1 consultant	--
			1 teacher	b.
			1 consultant	--
1976	6	Science and social studies units primarily for early immersion		c.

- a. This teacher received no pay, but did receive enough copies of the material for use with her class.
- b. Payment for a substitute teacher for 12 days at \$46.30 per day.
- c. See Table 67, page 249.

Ottawa's Bilingual High School

The bilingual program in the secondary schools caters to groups entering with widely different amounts of French training: students come from French schools, from late entry immersion, and from the basic French program. When early entry immersion students reach grade 9, courses will have to be provided for them as well. The work of curriculum development must include guidelines to meeting the needs of these different groups of students. Students enter the program in grade 9 and are expected to take four courses in French each year. Since not all students want the same options, more than four courses in French must be offered at a grade level.

Secondary schools traditionally give more responsibility to teachers for filling in the curriculum outline than do elementary schools. The material developed in 1974 covered 17 existing and proposed courses and contained rationales for developing teaching methods and materials, the course guidelines and a researched bibliography (Table 70). These materials were developed by the head of the bilingual department.

TABLE 70

OTTAWA BILINGUAL SECONDARY SCHOOL: COST OF CURRICULUM GUIDELINE DEVELOPMENT, 1974-1976

Year	Staff	Number of courses	Total cost
1974	1 teacher	17	\$ 1200.
1975	7 teachers	17	4300.
1976	4 teachers	12	3400.

In 1975 seven teachers worked on a contract basis writing 17 course curricula. Their honoraria ranged from \$150 to \$400 per course, which was intended to amount to about \$5 per hour. In fact, however, several teachers spent many more hours preparing curricula than the fees would suggest. In 1976 four teachers working independently of one another wrote 12 courses, receiving honoraria as in 1975. Typing costs included in Table 70 were \$400 in 1975 and \$350 in 1976. The teachers' contract called for 'a definition of rational objectives, course of study, text book recommendations, methodology, bibliography and evaluation techniques' to be included. In addition to preparing new courses, the bilingual department head feels that courses should be revised after two years of use by all the teachers of that course working as a group. The curricula prepared for secondary teachers do not, of course, eliminate the need for considerable teacher preparation.

CARLETON CURRICULUM DEVELOPMENT

Although there are many similarities between the two boards in the procedures used to develop curricula (e.g., both boards rely on teams of teachers to write the material), there are also differences. Most salient is the greater reliance in Carleton on materials useful for several program alternatives. Curriculum development at Carleton seems to have gone through two phases, the first when the emphasis was on the collection of materials used by teachers which were gathered into compendiums and distributed. The second phase, beginning in 1975, was a more concerted effort to develop program specific curricula and materials. For this reason we will first look at curriculum work for all programs for 1973 and 1974, and then look at the work done in 1975 and 1976.

Carleton Development, 1973-1974

In 1973 the Carleton Board of Education used experimental funding to establish a French language advisory group which consisted of a full-time co-ordinator and six teachers who worked half-time as resource teachers and half-time as classroom teachers. The role of this group was to gather and distribute materials and to support and guide teachers of new programs. The Carleton resource teachers did not 'specialize' in a single program alternative to the same extent as did Ottawa consultants. In some measure this was because Carleton schools are far apart geographically, so that it was more efficient for a single resource teacher to see all teachers when visiting a school. It meant, of course, that members of the group remained concerned with the needs of all programs.

In August, 1973, this group set up a resource centre in a vacant classroom at one school, where teachers of French could come to obtain teaching and reference materials. When the new board offices were completed, the French resource centre was permanently located there and it now contains copies of all board pedagogical packages, together with published pedagogical packages, tapes, catalogues, books and other reference material that might be helpful to teachers of the French programs. These are loaned to teachers and their classes both to fill in where curriculum development work is not yet adequate and as enrichment material. Teachers have complained that the centre's distant location makes it inaccessible. However, the present librarian is writing a catalogue from which orders can be placed to be delivered by the school courier service. Although not strictly 'curriculum development' this resource centre is an adjunct to such development.

The resource teachers also recognized the need for resource material for teachers of the new and expanding programs -- late entry

immersion beginning at grade 7 in 1973 at three schools; extended French at 20 schools in grades 1 to 8; and early entry immersion which expanded into new schools in 1973 and went into a new grade level every year. In 1973 and 1974 the appetite for curriculum materials by these programs was met by gathering materials used by teachers of the program -- materials they found in French books or translated from English sources -- and distributing these to other teachers. The compendiums developed in this way are indicated in Table 71. All of the curriculum materials included in this table are collections except for the Manual of Linguistic Objectives for Basic French developed in 1974. The last three items in the table are used by teachers of all programs. The cost of this work and the teacher support services given by the resource teachers was their half-time salaries.

Carleton Development, 1975-1976

In 1975 Carleton Board emphasized more formal curriculum development for all programs. However, some general material was still developed by resource teachers, who were now called special advisory teachers or SATs. This material is indicated in Table 72. Generally, one SAT developed each of these general resource books, working as time allowed during the year. (See Table 79.)

The Carleton curriculum writing sessions take place during the month of July and sometimes into August and the material is usually circulated by November. Teams, composed of SATs and teachers with experience teaching the program, do the writing. The teachers tend to be given more responsibility for the planning and design of the work than is the case in Ottawa. The per diem rate for these teachers was \$70 in 1975 and \$72.50 in 1976. The dollar cost was higher than in the Ottawa per diem costs because Ottawa, by taking teachers out of their classrooms during the school year, had only to pay for substitutes in

TABLE 71
PEDAGOGICAL MATERIAL DEVELOPED BY CARLETON RESOURCE
TEACHERS, 1973-1974

Year	Program	Grades	Description
1973	Extended	1-8	Collection of materials in all subjects being taught in French, gathered from English program teachers.
	Late entry	7	Resource book of subject materials gathered from English program teachers: 600 pages of dialogues and exercises.
	All	K-8	Games Resource Book.
	All	K-13	Film catalogue - listing of suitable films.
1974	Basic	K-1	Revision of earlier resource book. Includes methodology, but still requires teacher planning.
	Basic	K-8	Teachers' Manual of Linguistic Objectives: indicating vocabulary and structures to be taught at each grade level.
	Early and Late entry	1-8	Teachers required to send in copies of material used each month. This was organized, edited by resource teacher and distributed to other teachers.
	Extended	4	Environmental studies materials sent in by grade 1 to 6 teachers were organized and edited for this grade.
	All	K-13	French song book.

TABLE 72

GENERAL PEDAGOGICAL MATERIAL DEVELOPED BY CARLETON RESOURCE
TEACHERS, 1975-1976

Year	Grades	Description
1975	K-3	Christmas songs resource book.
	1-8	Tapes of songs included in resource song book to teach songs to teachers. (Never distributed)
1976	K-12	Listing of sources, with addresses, from which posters, pamphlets, and other pedagogically useful material may be obtained (some free).
	4-11	Book list.
	K-5	Booklets containing activities suggested as suitable for Halloween, Christmas, Easter, etc. (used for Basic and Immersion programs).

TABLE 73

CARLETON CURRICULUM DEVELOPMENT: COSTS FOR CLERICAL AND OTHER
STAFF TO SUPPORT TEACHERS WORKING ON MATERIALS, 1975-1976

Position	Year	Time	Total Cost	Program Cost			
				Basic	Immer.	Extend.	BIHI
Translator	1975	21 days	1470	368	735	368	--
	1976	20 days	1450	363	362	363	362
Illustrator	1975	6 weeks	740 ^a	185	370	185	--
	1976	6 weeks	1340	335	335	335	335
Typing	1975	18 weeks	2160	540	1080	540	--
	1976	54 weeks	6480	1620	1620	1620	1620
Editing	1975		--- ^b	--	--	--	--
	1976		2400 ^c	600	600	600	600
Resource runner ^d	1975	21 days	1470	490	490	490	--
TOTALS	1975		5840	1583	2675	1583	--
	1976		11670	2918	2917	2918	2917

a. Clerk seconded from other work, paid clerk's salary.

b. Coordinator received no extra pay for editing and coordinating work.

c. Lump-sum payment for summer work to resource librarian.

d. Resource runner found and delivered reference material from libraries, schools, etc.

the classroom. The SAT working during the summer is paid at the same rate as the other teachers on the team. His salary is included in the tables, and is apportioned among projects when he worked on more than one. Because curriculum teams are working simultaneously on several projects in the summer, the clerical and other support staff (translator, illustrator, editor) are shared by all teams. The costs of these services are shown in Table 73, which also indicates an approximate apportionment of the costs based on the number of illustrations and pages of the various packages.

Immersion in Carleton

Like Ottawa, Carleton began an early entry immersion in 1970 and its leading cohort entered grade 6 in 1976. Carleton Board also used experimental funding in 1973 to begin a late entry program. In September 1975 the third cohort was entering this 80 per cent French program in grade 7 and the second cohort was going into grade 8. In the early years of these experimental programs teachers had to develop much of the material using regular program curricula as guides and translating material from the regular program or adapting material designed for francophones. Collections of this material were made and distributed so there was sharing of material among teachers at the board (but not, it should be noted, much sharing across boards).

In the summers of 1975 and 1976, extensive development of pedagogical packages for these programs was undertaken. For immersion, a team was formed to work on each subject area of the curriculum. The work of various teams was gathered into a single binder which contained all the material relevant to the program either for a single grade or a group of grades.

The packages developed for early entry immersion and the cost of writing the material are shown in Table 74. It is apparent from

TABLE 74

CARLETON EARLY ENTRY IMMERSION: COST OF WRITING PEDAGOGICAL MATERIALS, 1975-1976

Grades	Description	Number of Staff	Total Days	Cost ^a
SUMMER 1975				
K	Revision of pedagogical package (curriculum, methods, materials) excluding only physical education. Not circulated in 1975-1976.	17	369 ^b	25830.
2	Total pedagogical package (800 pages, all subjects).			
3-6	Curriculum (outline of content to be covered).			
2-4	Resource book of stories and exercises.			
K-6	Collecting of resource material.	5	50	3500
SUMMER 1976				
1	Total pedagogical package (800 pages, all subjects).	9	154	11165
3-6	Language arts packages for each grade, includes curriculum, methods, list of references and materials.			
3	Total package, excluding math.			

a. Cost of support staff allocated to immersion, shown in Table 73, should be added to these figures and those in Table 75 to get total costs.

b. Includes 40 days of work in the fall by one teacher on K program.

this table that the board has tended to emphasize complete packages for the grades where the program has been in operation long enough for teachers to have experience with several cohorts and have learned what works well with children of these ages and second language ability. For later grades, where there is less experience with the program, guidelines (including aims and objectives) for the program as a whole and language arts packages were developed.

This pattern seems also to be followed for late entry immersion. In 1975 a detailed French language arts package was developed for both grades 7 and 8, but only curriculum guidelines were prepared for other subjects (Table 75). This package was adapted in 1975 for the leading cohort of early entry immersion reaching grade 7 (see Table 74). For geography, regular program guidelines were adapted and translated; physical education is taught following a package in French from another board, and the history course is based on a French text. Lesson plans in each subject were written for one term as an example for the rest of the year. The science curriculum was prepared in 1976.

TABLE 75

CARLETON LATE ENTRY IMMERSION: COST OF WRITING
PEDAGOGICAL MATERIALS, GRADES 7 AND 8
1976-1977

Year	Description	Number of Staff	Total Days	Cost*
1975	Detailed French language arts package, curriculum outline for other subjects.	4	62	4340
1976	Science curriculum	3	35	2538

* See note to Table 74.

Carleton Extended French

In extended French students take one academic subject in French as well as French language arts. In 1973 this program was offered in social studies, environmental studies or mathematics in grades from 1 to 8 (in 32 classes at 20 schools). This was an entirely new program, and curriculum materials were developed by the teachers themselves, using regular program curriculum guides. Some materials could be shared with immersion programs and, of course, basic French materials were used for language arts.

In 1975 curriculum outlines for grades 2 to 8 in all three subjects were prepared by a team. These follow the regular program, but allow for the vocabulary limitations of the second language. The need to limit this program in terms of grades and subject was becoming apparent, however. The program had proven itself in terms of learning French without loss of measured subject achievement comparable to students taking these subjects in their native language, but there was a need to concentrate on one subject and fewer grades. With this in mind another curriculum team began in 1975 to collect environmental studies materials from grade 1 to 8 teachers of all programs. (This collection was also used by immersion teachers in preparation of their packages.)

In 1976 a complete grade 4 environmental studies package was developed using this material. The package includes curriculum objectives and materials suitable for its share of the 75-minutes-per-day extended program. Material for grade 3 environmental studies was also selected and organized, although a complete package was not prepared. Costs are shown in Table 76. Development of a grade 5 package is planned for 1977.

TABLE 76

CARLETON EXTENDED FRENCH CURRICULUM DEVELOPMENT, 1975-1976

Year	Description	Number of Staff	Total Days	Cost*
1975	Curriculum for subjects taught in extended French in grades 2 to 8.	2	40	2800.
	Collection of environmental studies materials from all grade 1 to 8 teachers.	2	20	1400.
1976	Total environmental studies package for grade 4.	4	65	4713.
	Organization of environmental studies material for grade 3.			

* Cost of support staff as indicated in Table 74 should be added to obtain total costs.

Carleton's Bilingual Program in High Schools

A curriculum guideline was written for the grade 9 and 10 bilingual program (for students from late entry immersion) to be ready for the fall of 1975. Two teachers (working independently of the advisory group) worked for a month in summer 1975 to prepare curriculum guidelines. The following summer this guide was fleshed out into a comprehensive package. The costs for this work are shown in Table 77.

TABLE 77

CARLETON GRADE 9 AND 10 BILINGUAL OPTIONS PROGRAM:
CURRICULUM DEVELOPMENT, 1975-1976

Year	Description	Number of Staff	Total Days	Cost*
1975	Curriculum outline and Teachers' Manual.	2	40	2800.
1976	Package: Curriculum, materials and reference guide.	2	45	3263.

* Add cost of support staff from Table 74 to generate total costs.

RATIONALES, PARAMETERS AND COST

Curriculum packages are the intellectual tools that the teachers use to put knowledge and skills across to the student's mind. The quality of materials is likely to be crucial to the learning task. Parameters which most affect quality are likely to have to do with the content of the materials: what is to be taught, in what sequence? How are parts related to one another? What examples and readings and other work are to be put into the students' hands? What tests or other evaluation materials are to be given?

Because of the experimental or innovative nature of the French programs, pedagogical packages were developed by both boards, and were duplicated and distributed for classroom use. Both boards used teachers who had taught the program in the classroom to write the material. The rationale for this was that the classroom teachers were familiar with the activities and presentations that would *work* with children at a given grade level. The design of the packages was often strongly influenced by a consultant (the extent of teacher participation in overall design varied between the two boards). The content of the packages followed provincial Ministry guidelines, but the details of content and methodology were the fruit of people working in the board setting. Although different teachers and consultants would doubtless have stressed different learning goals and suggested different methods, we were given no reason to believe that different costs would have ensued. Generally, the costs came from the processes by which the packages were produced: the number of people involved, who did the editing, whether the work was done during the school year or in the summer, the length of time people were present, etc. There seems, then, to be little relationship between content and cost of pedagogical packages.

There is, however, a relationship between amount, or rather completeness of a package -- whether it has a sequenced curriculum guide, and carefully organized materials or lacks some of these -- and cost. As one would expect, costs are higher for complete packages than for curriculum outlines alone by a ratio of about 8 to 1, more or less.

There seems to be no set minimum amount of money that school boards can allot to curriculum development. For the experimental late entry immersion and extended French programs discussed here, both boards instituted programs in September, 1973, with almost no curriculum preparation. Because these programs were not offered elsewhere, no published pedagogical packages were available and teachers spent many nights and weekends translating English material and adapting francophone material for use, following English program curriculum guidelines. The teachers felt this was a hardship on both their classes and themselves.* It should be noted, however, that this lack of materials was not a financial decision but rather caused by the shortness of the time between deciding to offer the programs and the beginning of the school year.

It should not be thought that the undeveloped curriculum packages were cheap. Both boards made consultant staff available to help teachers get curriculum material and some of the cost of this staff should be debited as curriculum development cost. A second hidden cost was the high turnover of experienced staff in these programs after the first year. This loss was the greater because these teachers took with them their experience in the untried programs, leaving incoming replacements to go through it all again. The minimum dollar costs of program development may appear to be very low, but may, in fact, entail hidden

* R. Tourigny: Working Paper No. 14 and G. MacNab and R. Tourigny: Working Paper No. 23, The French Project, Research Centre, Ottawa Board of Education.

financial and non-financial costs.

It would seem logical that curriculum material be developed prior to teaching a program in the schools and that the funding of new or experimental programs should provide for this development. It must be noted, however, that in both boards the curriculum materials were developed by classroom teachers who had already taught the program. One solution to this dilemma would be to have new programs presented on a pilot basis to one or two classes of students by a team of two or three teachers who would have more time during the year to develop materials. The team would be expected to produce a curriculum package based on these materials and their experience before the program was offered across the board. Another factor to be considered in installing new curricula is the training of teachers to use them. One of the teacher-writers urged that new curricular material not be given to teachers without some introduction or training. Follow-up would also be useful. Whatever the procedure used, curriculum development should precede wide-scale introduction of new programs.

On the other hand there seems to be no maximum cost, either. The curriculum packages now in use have developed cumulatively over the four years these new programs have been in operation. In the first year teachers had to scrounge about for materials. Consultants used the materials found by teachers and themselves to produce a compendium of materials for the second year. In preparation for the third year, these materials were re-organized around a well-developed set of curriculum objectives, and in the fourth year a revision added more material and improvements in the sequencing and comprehensiveness of the curriculum. Even programs in operation for many years have need of revision and revitalizing from year to year. Thus the development of a curriculum package by a board is not a summer project, but rather occurs by accretion.

Because both boards relied on experienced teachers to prepare materials, an important factor in quality of the package has been the selection of teacher-writers. One board has teachers write during instructional time, providing substitutes for the classroom, while the other board relies on enticing teachers to work over the summer.

One criticism voiced about the curriculum development teams is that they do not include a person who has learned French as a second language. A teacher of Basic French commented that some packages introduce structures which are too difficult for anglophone students even though they appear easy to native French speakers. The example cited was the introduction of the *passé simple* in grade 5 readers to children who have heard only the *passé composé*. More consultation on curriculum with regular program teachers or consultants is also suggested to avoid introducing French grammar and constructions (in Basic French) before students have had the grammar in English.

One other criticism which has been voiced about almost all programs at both boards concerns the quality of the illustrations. Usually these locally produced programs are illustrated with simple line drawings in black and white. Often these are like colouring book illustrations and are designed to be filled in with crayon as seat work. The artistic quality is generally poor, which may be bad enough, but occasionally the art work is so poor that the appropriate vocabulary word is doubtful. Is that cylinder *une boîte* or *une pile*? The difficulty of illustrating verbs or adjectives can be even more formidable. Because illustrations are often used to convey the meaning in second language teaching (so that an English translation need not be used), the quality of the illustrations demands more attention.

As has been stated, these pedagogical packages were developed by the boards because the published materials are not suitable either

because of the length of time for French, the French ability of the children, the subject matter or the methodology. Often, the material, whether initially planned by teachers or consultants, has been used in the classroom and revised and used again. It represents a considerable investment in an intellectual capital that might be used by other boards.

The Ministry might want to consider the establishment of a library or curriculum development research centre where this material could be made available to other boards either for use as packages (as is now being done for French language schools by the Centre Franco-Ontarien de Ressources Pedagogiques) or as resource material to draw on in building a curriculum to suit their specific needs. Investment in the development of curriculum and pedagogical materials should be considered as a capital investment for all programs, and not only French programs. The development of a collection of curriculum packages (which would include when and where they had been used, teacher evaluations of the package, and evaluations of the learning outcomes) would be a long-term investment in intellectual capital for all schools of the province. When development of such pedagogical materials is funded by the Ministry, access by other boards in Ontario should be ensured through providing copies to boards which want to use them as resource material and duplication for boards which want to use them as packages.

TABLE 78

OTTAWA PUBLIC SCHOOL CONSULTANTS IN FRENCH: OUTLINE OF ACTIVITIES

Year	Id.	Duties
All consultants are expected to spend about 80 per cent of their time assisting teachers in the schools by providing advice and suggesting and circulating materials. Each of four consultants is responsible for teachers of a program: A for basic French kindergarten to grade 6; B for primary early entry immersion, kindergarten to grade 3; C for grades 4 through 6 immersion, both early and late entry; and D for intermediate immersion. In addition, consultants conduct a half-day workshop or dinner meeting for teachers new to their program each August.		
1973	A	Team leader for basic French grade 2 curriculum.
	C	Developed grade 6 late entry immersion material including social studies units. Worked through summer.
1974	A	Revision of basic kindergarten package; development of basic grade 3 package.
	B	Language Arts listening centre corrections.
1975	A	Revision of basic grade 1 package; development of grade 4 package.
	B	Team leader for 32 teachers who did phonics materials development for early entry immersion.
	B	Team leader for development of early entry social studies units, including extensive pre-planning.
	C	Team leader for immersion health units.
1976	D	Revised linguistic skills objectives and methodology material for late entry immersion.
	A	Team leader for basic grade 5 package.
	B	Team leader for development of 16 science units for immersion.
	C	Team leader for development of science units for junior level immersion . Team leader for development of immersion social studies units.
	D	Wrote general guidelines for basic French in grades 9 and 13. Worked with one teacher revising grade 7 early entry immersion package and developing new grade 8 curriculum. Sent out survey questionnaire to discover needs of grade 6 late entry immersion teachers.

TABLE 79

CARLETON PUBLIC SCHOOL CONSULTANTS IN FRENCH: OUTLINE OF ACTIVITIES

Year	Id.	Duties
Summer 1973	All	Set up resource centre (two weeks).
1973-74	All	Half-days teaching; collated materials sent in by grades 1-8 English teachers and distributed them to teachers of new French programs; provided resource assistance to teachers.
	A	Remedial teacher for all immersion programs.
	C	Librarian in resource centre.
	D	Wrote games book.
	E	Wrote film catalogue.
	B	Started book of songs.
Summer 1974	ABC	Moved resource centre (2 weeks); conducted orientation week for new teachers.
1974-75	ABC	Resource teachers assisted classroom teachers; edited materials collected from teachers and distributed them to immersion teachers; conducted workshops on professional development days.
	C	Librarian at resource centre; wrote basic French linguistics manual and Christmas song book.
	F	Revised basic French K-1 resource book.
	A	Remedial teacher for students in immersion program; planned summer development work.
	B	Completed French song book.
Summer 1975	ABC	Conducted orientation week for new teachers.
	A	Supervised and coordinated all program development work (except grades 9 and 10), edited programs; had tapes made to accompany song book (never distributed).
	C	Was resource teacher two days per week for teacher finishing primary level basic French program.
1975-76	ABC	Provided assistance to teachers; conducted workshops on professional development days; conducted orientation week for new teachers.
	A	Remedial teacher for immersion students; planned summer development work.
	B	Translated ministry curriculum guidelines; outlined curriculum for grade 7 early immersion; developmental work on extended grade 4 to 8 program.
	C	Wrote list of books for use of teachers and students; conducted French drama festival; wrote booklets of activities related to Halloween, Christmas, Easter, etc.

cont.

Table 79 - cont.

Year	Id.	Duties
Summer 1976	A	Team leader for development of comprehensive early immersion pedagogical packages and proof read evenings.
	B	Team leader for development of extended French, late immersion and liaison for development of grades 9 and 10 programs for basic and bilingual.
1976-77	BC	Provided assistance to teachers, organized and conducted workshops.
	B	Program development for extended French and late immersion; helped mostly extended, late immersion and secondary teachers.
	C	Worked on revision of primary basic French program (incomplete); developed materials source listing for K-13; conducted French drama festival.

Chapter Ten: Understanding Program Costs: An Overview

The theme of the cost analysis model is that a program does not have a single cost associated with it, but rather *has a range of possible costs that are related to decisions about the various properties or parameters of the program*. A program is designed by specifying the time to be devoted to various subjects, the pedagogical approaches, class size, amount of teacher planning time, etc. These decisions set the values which the parameters will take for the program being designed. These values, in turn, determine program costs.

PROGRAM CONTENT AND DELIVERY

'Program' here may be used in a more inclusive way than is usual. A program is not only the whole package of information and skills presented to a student or group of students during the available instruction time, but also the organization of teachers and texts delivering the content. Furthermore, the school milieu within which the program is taught may affect costs. Indeed, most of the costs of programs are those of providing teachers and classrooms, and not of the program content, although either content or pedagogy may influence costs indirectly by influencing decisions about teacher deployment.

Because the program covers all the time available for instruction and because its costs are mainly those of providing teachers and classrooms during this time, *the model does not and cannot provide a means of determining the costs of teaching French or any subject in isolation from the costs of all subjects in the program*. To attempt to do so would be like trying to determine the cost of the warp separately from the cost of the woof in buying a piece of cloth. Relative contributions of subjects to the total can be found, but these depend on the

way the whole is taught. For instance, in the primary program (II) in School A in 1976 (Table 18) the core subjects (class) teacher has about 10 per cent of the time allotted for planning. This time is charged to the core subjects, increasing the cost of presenting them. However, if the 20-minute basic French part of the program were eliminated and no other specialist or relief teacher replaced the French teacher, then the class teacher would have less than 3 per cent planning time (during music) and core subjects would cost less per unit of time to present. A second instance is the immersion program where mathematics, art, social studies, and science are taught in French. Although time is allotted to French language arts, French is also learned during the time devoted to other subjects. There is no way to disentangle the costs of this dual purpose teaching.

These examples serve to illustrate the fact that *the costs of programs are not dependent on content as much as on organizational features of the school and program*. In elementary schools cost increases for basic French are the result, not so much of the fact that basic French is taught, as of the fact that it is taught by a specialist, and not the regular class teacher. However, in intermediate schools which are organized on rotary schedules, the French teacher is one of several specialists and so French costs no more than the other subjects which might be taught in its stead. It is the class organization of the elementary schools, taken together with the belief that French can only be taught by a specialist, which creates the extra costs.

Of course, French is not the only subject that is seen to have special requirements that are related to costs. Industrial arts, home economics and physical education are often taught to part classes,

presumably because the subjects required it. It should be noted, however, that these 'requirements' are not universally accepted. Some schools in our study did not teach industrial arts, home economics or physical education to part classes, and French is taught by the classroom teacher in England and Wales (Burstall, 1974). A subject, such as science or art, may have demands for materials and equipment beyond the usual texts and scribblers but the cost of these needs are almost always much less than for personnel caused by small classes or specialists.

In any case, most subjects do not make special demands. For this reason, and because most subject demands operate indirectly, the organization for delivering programs is the focus of the cost analysis model.

PRODUCTIVITY

The organization of the school is the way it divides the children to be taught into groups and assigns teachers to those groups, to planning or spare time and to other duties in the school. Since the salaries of teachers are the major cost of schools, this organization is of great importance.

In this section five parameters of teacher utilization will be discussed: class size, planning time, changes in class size for some program elements, and the fit of classes and of schedules to the school size.

Class size determines the average number of students for which a teacher is responsible during instruction time. The larger the class size the fewer teachers will be needed for a given student enrolment, and the lower, therefore, will be the cost per pupil.

Starting from the point of view that the product of the school is learning in children, productivity may be evaluated either by the

number of children taught or by the total amount of learning produced. That is, increased productivity on the part of a teacher may occur either because he has taught more children. Insofar as measurement of taught more to the same number of children. Insofar as measurement of bits learned is possible, there seems to be little interaction between the two kinds of productivity -- decreasing the numbers taught does not increase the learning (Averch, 1972:44-45; Hendleman, 1975; Morrison, 1976:36-49). However, it is very difficult to measure the 'bits' learned by children and this leads to number of children taught being selected as the usual criterion for productivity.

Another reason for making numbers of children the criterion is that schools, in addition to their teaching function, have a custodial or 'child sitting' function which is almost as important as teaching. Having custody of children for a block of time provides the school with the opportunity to instruct, but it also constrains the school to divide students into groups and to assign a teacher to each group throughout the school day. Even though the teacher may be actively teaching only smaller groups, he must continue to supervise the large group. Although one can conceive of other ways of organizing the teaching function (e.g., through tutorials), this custodial function ties productivity to numbers of students and costs to class size.

In seeking to control costs, boards attempt to keep class sizes at a level that is reasonable in terms of both cost and teacher workload. These two forces pull in opposite directions and the 'reasonable' balance between them is defined differently in different jurisdictions and at different times. Despite this arbitrariness, setting class size, whether directly or by setting PTR or teacher allocations to schools, is one means the school board has of influencing the productivity of teachers.

Planning Time. The amount of planning time allowed teachers during the school day interacts with class size in determining productivity. Where class size sets the number of students the teacher instructs at a time, planning time indicates how much of the time available will be spent teaching. Because students are there to be taught, another teacher must be responsible for the class while its regular teacher has planning time. In terms of numbers, the planning time allowed means less of the class time covered by a single teacher.*

Program Element Class Size. The class may not stay together as a group throughout the available instruction time, but may break apart and take some program elements in larger or smaller groupings. Such changes of class size occurred when boys and girls in one class took gym from different teachers, when four classes took five united arts, and when each grade level of a combined class took either basic French or English to immersion separately. At the secondary schools, where there is no 'class' which is on-going for the whole school day, 'class size' always refers to program element or subject class size.

These three parameters are all subject to policy decisions which will affect productivity of teachers. To the extent that boards set policies controlling overall class size, defining appropriate planning time, or indicating what subjects are to be taught to larger or smaller groups, and *to the extent that these policies are followed*, the board is able to determine the number of students taught per teacher. Where these policies are the same for all programs and are uniformly carried out, the major costs of the programs will be similar. The next two parameters are related to schools, not programs, and will affect how well such board policies can be followed in schools.

* It is possible that planning time given to teachers would increase their productivity in terms of bits of knowledge learned. However, the writer is not aware of any studies examining this issue.

Enrolments and Class Size. Actual class sizes in elementary schools are determined by dividing the school enrolment into groups which are as close as possible to the desired class size on the average. The enrolment is determined by the number of students in the sending area. Unless the enrolments are large enough -- about 160 to 200 students -- depending on desired class size, fluctuations in enrolments will make it difficult to maintain reasonable class sizes. In the boards in this study, elementary schools were generally built to hold about 400 students and were located far enough apart that each sending area would generate this number. A school of this size not only has enough students to maintain class size, but also allows some streaming or other selection of students in forming classes.

However, in the past ten years or so, enrolments in some of these neighbourhood schools have dropped so that class sizes are difficult to maintain. This problem was exacerbated, but not caused, by the French immersion program because it drew students away from the regular neighbourhood program. In most, if not all, cases the impact of the French immersion program was serious only where enrolments were already low. Because immersion was optional, its centres could be located, and even moved, to adjust to demand. This flexibility enabled immersion to have enrolments which were adequate (after the initial few years of the program). However, closing neighbourhood schools is more difficult even where enrolments are inadequate to support three classes. In the three years covered by this study one neighbourhood school has become an immersion only school, but no other has been closed.

Since sending areas for intermediate and secondary schools are larger, enrolments are usually adequate to support desired class sizes. However, class size problems may arise in secondary schools

if courses are offered for which student demand is limited. In the high schools studied here, such courses were offered either because teachers in a department were willing to teach larger sections of other, more popular, courses or to take on an extra period of teaching, or because the board allowed extra staff for them. There would seem to be limits to these arrangements and if secondary enrolments decline the range of course offerings might be curtailed.

Scheduling. When schools are small it may also be difficult to schedule the time of the French teacher or other specialist who is shared among the classes at a school. Unless the number of classes is equal to the number of periods the specialist is expected to teach, he will be over- or, more commonly, under-used. Specialist teachers can be shared among two or three schools but this involves additional travel time, and may not solve the problem completely.

Differences among programs in average class size, in amount of planning time and program element class size will lead to differences in productivity of teachers and hence in program costs. Although affected by school size, these parameters are strongly influenced by board policies. Where they are held constant across programs, program costs will be similar, because teacher productivity will be similar.

FRENCH PROGRAMS AND ALTERNATE PROGRAMS

It does not follow, however, that the introduction of alternate programs will not affect costs. The examination of French programs has indicated two ways in which these programs have affected costs, even when board policies held these parameters constant across programs.

First, the French programs were responsible for introducing daily planning time for elementary teachers by bringing a specialist in to teach basic French. In immersion programs the English to

immersion teacher frees roughly the same amount of planning time over the seven years from kindergarten to grade 6 as does the 40-minute basic French. Planning time in both programs is greater than in the one-teacher-to-one-class arrangement, and so costs, though equal across programs, are higher than they would be without the specialists and planning time. These additional costs, although similar, result from the time of the specialist and the difficulty of using this teacher time for other classes. They are inherent in each program and are not costs of offering choice.

Second, French immersion programs may have been a factor in decreased class sizes. In 1973 small enrolments in Ottawa's immersion program made it impossible to meet the board's class size policy, thus increasing per pupil costs of the program. In 1976 larger enrolments in immersion enabled that program to have larger classes, on the average, than in the regular. However, the loss of students to immersion from small, declining school enrolments may have made class size adjustments somewhat more difficult. These additional costs are generated because choice of programs is available and the alternative programs create separate enrolment pools.

TRANSPORTATION

Offering alternate programs, whether French or something else, incurs transportation costs only when they are offered outside the neighbourhood school. The French immersion programs were programs given in only a few schools, which draw children from large sending areas in order to have enrolments large enough to maintain class size. Because only a small proportion of students opted for immersion the boards had to concentrate these students at a few centres or face extra teacher and classroom costs. Although the bussing is costly, it is less than the cost of extra teaching staff.

The cost of bussing depends on the number of busses operating. That is, just as teacher and classroom costs are incurred on a per class basis, so the cost of vehicle and driver are incurred on a per bus basis. Policy aimed at trimming transportation costs may seek to increase the number of riders per bus (comparable to increasing class size) or to decrease the total number of riders. Board policy about how close to home riders are picked up (which affects riders per route), and how far from school children must live in order to be bussed (which affects total number of riders) and similar convenience of service parameters are important factors in determining the total cost of bus service. The influence of these policies will be felt whether bussing is to regular or alternate programs.

In areas where all children are bussed to school, the additional costs of bussing to alternate programs in schools outside the neighbourhood are small. They consist of the gas and bus upkeep for travelling the distance between schools, plus possible extra runs because of the loss of time to pick up students that this travel causes. These latter could be avoided if the time of earliest pickup could be advanced to cover the extra travel time.

The costs of bussing, whether to regular or alternate programs, are those of gathering students to make enrolments large enough so staff can be fully utilized. The size of enrolments that are economical increases as more specialists are added to program delivery, which is the reason high schools must be much larger than elementary schools. The amount of bussing necessary to gather sufficient enrolments will depend in large part on the density of population, although it is affected by program and by the convenience of service parameters. The board incurs transportation costs rather than the larger costs of under-utilized staff in areas where population is less dense. The

effect of offering alternate programs is to decrease the density of population for both regular and alternative programs.

COST OF SUPPLIES

The cost of textbooks, scribblers and other material used to present a program is determined more by board policy on what can be spent than on inherent needs of programs. Although there are probably thresholds below which lack of supplies will affect learning, neither board studied here was near that point. Indeed, we found a few principals who felt that an over-abundance of workbooks and similar material hindered rather than helped program delivery by making pupils dependent on fill-in-the-blank techniques and allowing teachers to be lazy in developing their presentation of the work.

There was general agreement that the material for immersion was somewhat more expensive, because of giving language arts twice, to higher costs of items in French, and less durable materials, but there was less agreement across boards as to how much this cost was. At one board it was estimated to be 15 to 20 per cent. At the other board the additional costs were felt to be small enough that no adjustment in per pupil allowance was necessary.

CURRICULUM DEVELOPMENT

When text and workbooks -- published pedagogical packages -- are purchased for use in a program their price includes the developing and writing of a curriculum. The teacher has only to adapt it to the needs of the students. Some of these pedagogical packages were praised: there are apparently two or three primary language arts packages which are good and provide adequate materials. Teachers may use one or a combination of these selected to fit the needs of their students and their own teaching methods, and there is no need for further

curriculum development inside the board. For other courses, no adequate pedagogical package was available and teachers were forced to find materials when they could and adapt inadequate texts when they could not. The level 2 secondary history course was a case where changing curriculum demands had not yet been met by publishers.

Commercial packages were not available for the immersion, extended and basic French programs, and both boards provided funds for the development of curriculum. These funds paid for teacher time which was used to produce comprehensive curriculum guides and lists of materials and, especially for elementary grades, to develop activities and write material which would flesh out the guidelines supplied by consultants.

These efforts met with varying degrees of success (as do commercial packages). One of the most successful was a series of science units for junior grades. These were developed simultaneously for both regular and immersion programs by teams consisting of a science consultant, a French consultant, and both regular program and immersion teachers.

French language arts were approached differently by the two boards with Carleton developing resource books of stories, songs and activities which could be used in all programs, together with detailed curriculum guides for each program. In Ottawa language arts packages were developed for both basic and immersion programs.

Curriculum development has not proven to be a one-shot affair. Revision and further development of materials have been necessary. Team efforts seem to have been the more successful; some materials developed under individual contracts have never been used. Criticism of materials has included the comment that, having been developed by

francophones, it does not recognize the particular problems of anglo-phones learning French.

Money spent on curriculum development is an investment in capital goods which the teacher uses to produce more 'bits' of learning in pupils. While school organization will determine teacher productivity in terms of number of pupils processed, pedagogical packages are tools (capital goods) which will be more or less effective in increasing the productivity of teachers in terms of amount of learning per pupil.

Furthermore, the investment in pedagogical package content may be spread over a larger number of classes at small additional cost by printing more copies. Because curriculum development can take place outside of individual boards, because it results in rather permanent intellectual capital, and because it may easily be shared among boards, it was suggested that development of pedagogical materials and of a resource centre where these could be stored might be an appropriate investment for an educational ministry.

CONCLUSION

The analysis of costs began by noting that schools and school programs are designed by selecting values for various parameters, or properties, of programs such as class size or pedagogical approach. Differences in costs result from different choices, different policies, about the value which a parameter should take in each program.

The model indicated three major types of parameters: 1) those describing the content, sequencing and pedagogy of the program or curriculum; 2) those indicating how teachers and texts are to be marshalled to deliver the program to groups of students; and 3) those describing the support services and school milieu. *Costs are not intrinsic to the program or curriculum, but depend on choices made*

about the organization of people and materials which deliver the program to the students and about the buildings and support services which provide space and the amenities which facilitate delivery of the program message. Costs depend on policies made about personnel and their assignment, classroom space, class size, bussing, program location, and number of workbooks.

The major element contributing to costs is the cost of teachers. The time a teacher is responsible for a class together with the planning (or non-contact) time associated with this instruction is a cost of the class. Instructional materials are added to teachers to obtain per class costs. These are divided by the class size to give a per pupil cost. Added to these are the costs of the milieu: the support services like the library, remediation, and administration and the cost of the building operation. School enrolment affects cost both because these milieu costs are divided among the enrolment to figure per pupil costs and because small enrolments may hinder class size maintenance. Bussing costs may be seen as a part of milieu costs, an expense incurred to keep school enrolments viable. The cost of designing curriculum and developing materials is another category to be added to the cost equation. Curriculum development costs can be perceived as an investment in the intellectual capital of the school to be amortized over time as well as divided among students in the initial program years.

The title of this study is 'A Cost Analysis Model for Programs in French as a Second Language'. However, it should be noticed that the model is not only a means of looking at costs of French, but rather a technique for examining the costs of *any program*. Indeed, one of the premises of the analysis is that program elements cannot be studied in

isolation. For example, giving time for basic French enabled the class teacher to have planning time and in one school having extended French freed a teaching vice principal for administrative duties. No technique which does not include an analysis of these ramifications can adequately indicate the costs of any program element.

The analysis presented in this study has attempted to indicate how the organization and policies of the school affect program costs. There were omissions. For instance, costs of administration related to French or to offering alternative programs were not examined. Although we believe there may be such costs, initial soundings of the topic convinced us that it would be virtually impossible to disentangle the grumblings about problems with French from mutterings about over-work in general, and so real demands of the program offerings could probably not be determined. Another aspect which might have been more fully developed was the interaction between population density in a sending area, transportation costs, and costs attributable to small enrolments. Furthermore, this presentation has played down actual dollar costs in favour of a methodology by which the source of costs could be understood.

Despite its failings, we believe the model presents a method for a rational assessment of costs in relation to program needs.

Summary

A program does not have a single cost associated with it, but rather *has a range of possible costs that are related to decisions about the various properties or parameters of the program.* A program is designed by specifying the time to be devoted to various subjects, the pedagogical approaches, class size, amount of teacher planning time, etc. These decisions set the values which the parameters will take for the program being designed. These values, in turn, determine program costs.

A program is the whole package of information and skills presented to a student or group of students during the available instruction time, and also the organization of teachers and texts delivering the content. Furthermore, the school milieu within which the program is taught may affect costs. Indeed, most of the costs of programs are those of providing teachers and classrooms, and not of the program content, although either content or pedagogy may influence costs indirectly by influencing decisions about teacher deployment.

Because the program covers all the time available for instruction and because its costs are mainly those of providing teachers and classrooms during this time, the model does not and cannot provide a means of determining the costs of teaching French or any subject in isolation from the costs of all subjects in the program. To attempt to do so would be like trying to determine the cost of the warp separately from the cost of the woof in buying a piece of cloth.

The organization of the school is the way it divides the children to be taught into groups and assigns teachers to those groups, to planning or spare time and to other duties in the school. Since the salaries of teachers are the major cost of schools, this organization is of great importance. Four parameters of teacher utilization were discussed: class size, planning time, and the fit of classes and of schedules to the school size.

Class size determines the average number of students for which a teacher is responsible during instruction time. The larger the class size the fewer teachers will be needed for a given student enrolment, and the lower, therefore, will be the cost per pupil. The relationship between class size and per pupil costs is hyperbolic, that is, per pupil costs rise more sharply as class size gets smaller.

In seeking to control costs, boards attempt to keep class sizes at a level that is reasonable in terms of both cost and teacher workload. These two forces pull in opposite directions and the 'reasonable' balance between them is defined differently in different jurisdictions and at different times. Despite this arbitrariness, setting class size, whether directly or by setting PTR or teacher allocations to schools, is one means the school board has of influencing the productivity (in terms of number of students taught) of teachers, and hence of controlling costs.

Enrolments and class size. Actual class sizes in elementary schools are determined by dividing the school enrolment into groups which are as close as possible to the desired class size on the average. The enrolment is determined by the number of children in the sending area. Unless the enrolments are large enough--about 160 to 200 students depending on desired class size--fluctuations in enrolments will make it

difficult to maintain reasonable class sizes. In the boards in this study, elementary schools were generally built to hold about 400 students and were located far enough apart that each sending area would generate this number. A school of this size not only has enough students to maintain class size, but also allows some streaming or other selection of students in forming classes. However, in the past 10 years or so, enrolments in some of these neighbourhood schools have dropped so that class sizes are difficult to maintain.

Offering alternate programs, like French immersion, may affect per pupil costs through class size in one of three ways: a decision may be made to keep class sizes low in the alternate program, enrolments in the alternate program may be too small to maintain class size or the alternate program may draw students away from the regular program affecting its enrolments. In 1973 low enrolments in the French immersion programs kept its classes small at the two boards in this study. In 1976, when the program extended to grade 6 and the proportion of total system enrolments had increased, the average class sizes had also grown. In one board the average in immersion exceeded the average in regular program classes. However, in this board 29 (out of 55) schools had an enrolment of fewer than 160 students, and an average class size of 26, low for this region. French immersion may have accelerated the enrolment/class size problem, but its effect could not have been great. Had no child attended immersion, only six of the 29 schools would have had enrolments of 160 and five of these would still have enrolments of less than 200. In the other board the average class size in immersion was 25.2 which compared to 28.2 in the regular program (grades 1 to 6). Because immersion was optional, its centres could be located, and even moved, to adjust to demand. This flexibility enabled immersion to have enrolments which were adequate (after the initial few years of the program). However,

closing neighbourhood schools is more difficult even where enrolments are inadequate to support three classes. In the three years covered by this study one neighbourhood school has become an immersion only school, but no other has been closed.

Since sending areas for intermediate and secondary schools are larger, enrolments are usually adequate to support desired class sizes. However, class size problems may arise in secondary schools if courses are offered for which student demand is limited. In the high schools studied here, such courses were offered either because teachers in a department were willing to teach larger sections of other, more popular, courses or to take on an extra period of teaching, or because the board allowed extra staff for them. There would seem to be limits to these arrangements and if secondary enrolments decline the range of course offerings might be curtailed.

Planning Time. The amount of planning time allowed teachers during the school day interacts with class size in determining productivity of teachers. Where class size sets the number of students the teacher instructs at a time, planning time indicates how much of the time available will be spent teaching. Because students are there to be taught, another teacher must be responsible for the class while its regular teacher has planning time. In terms of numbers, the planning time allowed means less of the class time covered by a single teacher.

In secondary and intermediate schools where students rotate from teacher to teacher, planning time is allocated to teachers by giving them a 'free' period, one when they have no class. In elementary schools, where one person usually teaches a class all day, planning time is generated when a specialist teaches a subject such as music or French. In 1976 four of the five elementary schools studied allowed their teachers about 15 per cent of their time for planning. The school with least planning

time, 12 per cent, had a 20-minute basic French program and no immersion. One school had only grades 6 to 8 and it allowed about 20 per cent of time for planning. In secondary schools, the teachers spent a quarter of the available instruction time planning.

In elementary schools cost increases for programs including basic French are the result, not so much of the fact that basic French is taught, as of the fact that it is taught by a specialist, and not the regular class teacher. However, in intermediate and secondary schools which are organized on rotary schedules, the French teacher is one of several specialists and so French costs no more than the other subjects which might be taught in its stead. It is the class organization of the elementary schools, taken together with the belief that French can only be taught by a specialist, which creates the extra costs.

In French immersion programs, as presented in these boards, the English-to-immersion teacher frees roughly the same amount of planning time over the seven years from kindergarten to grade 6 as does the 40-minute basic French. Planning time in both programs is greater than in the one-teacher-to-one-class arrangement, and so costs, though equal across programs, are higher than they would be without the specialists and planning time. These additional costs, although similar, come from the time of the specialist and the difficulty of using this teacher time for other classes. They are inherent in the delivery of each program in these boards and are not costs of offering alternatives.

Class size and planning time are subject to policy decisions which will affect productivity of teachers. To the extent that boards set policies controlling class size and defining appropriate planning time, and to the extent that these policies are followed, the board is able to determine the number of students taught per teacher. Where these policies are the same for all programs and are uniformly carried out, the major costs of the program will be similar. It does not follow,

however, that the introduction of alternate programs will not affect costs. The examination of French programs has indicated two ways in which these programs have affected costs, even when board policies held these parameters constant across programs.

For example, the French programs were responsible for introducing daily planning time for elementary teachers by bringing a specialist in to teach basic French to regular program students and English to immersion students.

Scheduling. When schools are small it may also be difficult to schedule the time of the French teacher or other specialist who is shared among the classes at a school. Unless the number of classes is equal to the number of periods the specialist is expected to teach, he will be over- or, more commonly, under-used. Specialist teachers can be shared among two or three schools but this involves additional travel time, and may not solve the problem completely.

TRANSPORTATION

Offering alternate programs, whether French or something else, incurs transportation costs only when they are offered outside the neighbourhood school. The French immersion programs were programs given in only a few schools, which draw children from large sending areas in order to have enrolments large enough to maintain class size. Because only a small proportion of students opted for immersion the boards had to concentrate these students at a few centres or face extra teacher and classroom costs. Although the bussing is costly, it is less than the cost of extra teaching staff.

The cost of bussing depends on the number of busses operating. That is, just as teacher and classroom costs are incurred on a per class basis, so the costs of vehicle and driver are incurred on a per bus basis.

Policy aimed at trimming transportation costs may seek to increase the number of riders per bus (comparable to increasing class size) or to decrease the total number of riders. Board policy about how close to home riders are picked up (which affects riders per route), and how far from school children must live in order to be bussed (which affects total number of riders) and similar conveniences of service parameters are important factors in determining the total cost of bus service. The influence of these policies will be felt whether bussing is to regular or alternate programs.

In areas where all children are bussed to school, the additional costs of bussing to alternate programs in schools outside the neighbourhood are small. They consist of the gas and bus upkeep for travelling the distance between schools, plus possible extra runs because of the loss of time to pick up students that this travel causes. These latter could be avoided if the time of earliest pickup could be advanced to cover the extra travel time.

The costs of bussing, whether to regular or alternate programs, are those of gathering students to make enrolments large enough so staff can be fully utilized. The size of enrolments that are economical increases as more specialists are added to program delivery, which is the reason high schools must be much larger than elementary schools. The amount of bussing necessary to gather sufficient enrolments will depend in large part on the density of population, although it is affected by program and by the convenience of service parameters. The board incurs transportation costs rather than the larger costs of underutilized staff in areas where population is less dense. The effect of offering alternate programs is to decrease the density of population for both regular and alternate programs.

COST OF SUPPLIES

The cost of textbooks, scribblers and other material used to present a program is determined more by board policy on what can be spent than on inherent needs of programs. Although there are probably thresholds below which lack of supplies will affect learning, neither board studied here was near that point. Indeed, we found a few principals who felt that an over-abundance of workbooks and similar material hindered rather than helped program delivery by making pupils dependent on fill-in-the-blank techniques and allowing teachers to be lazy in developing their presentation of the work.

There was general agreement that the material for immersion was somewhat more expensive, because of giving language arts twice, higher costs of items in French, and less durable materials, but there was less agreement across boards as to how much this cost was. At one board it was estimated to be 15 to 20 per cent. At the other board the additional costs were felt to be small enough that no adjustment in per pupil allowance was necessary.

CURRICULUM DEVELOPMENT

When texts and workbooks -- published pedagogical packages -- are purchased for use in a program their price includes the developing and writing of a curriculum. The teacher has only to adapt it to the needs of the students. Some of these pedagogical packages were praised, but for other courses no adequate pedagogical package was available.

Commercial packages were not available for the immersion, extended and basic French programs, and both boards provided funds for the development of curriculum. These funds paid for teacher time which was used to produce comprehensive curriculum guides and lists of materials and, especially for elementary grades, to develop activities and write material which would flesh out the guidelines supplied by consultants.

These efforts met with varying degrees of success (as do commercial packages). One of the most successful was a series of science units for junior grades. These were developed simultaneously for both regular and immersion programs by teams consisting of a science consultant, a French consultant, and both regular program and immersion teachers.

French language arts were approached differently by the two boards with Carleton developing resource books of stories, songs and activities which could be used in all programs, together with detailed curriculum guides for each program. In Ottawa language arts packages were developed for both basic and immersion programs.

Curriculum development has not proven to be a one-shot affair. Revision and further development of materials have been necessary. Team efforts seem to have been the more successful; some materials developed under individual contracts have never been used. Criticism of materials has included the comment that, having been developed by francophones, it does not recognize the particular problems of anglophones learning French.

Money spent on curriculum development is an investment in capital goods which the teacher uses to produce more 'bits' of learning in pupils. While school organization will determine teacher productivity in terms of number of pupils processed, pedagogical packages are tools (capital goods) which will be more or less effective in increasing the productivity of teachers in terms of amount of learning per pupil.

Furthermore, the investment in pedagogical package content may be spread over a larger number of classes at small additional cost by printing more copies. Because curriculum development can take place outside of individual boards, because it results in rather permanent intellectual capital, and because it may easily be shared among boards,

it was suggested that development of pedagogical materials and of a resource centre where these could be stored might be an appropriate investment for an educational ministry.

CONCLUSION

The analysis of costs began by noting that schools and school programs are designed by selecting values for various parameters of programs, such as class size or pedagogical approach. Differences in costs result from different choices, different policies about the value a parameter should take in each program.

The model indicated three major types of parameters: 1) those describing the content, sequencing, and pedagogy of the program or curriculum; 2) those indicating how teachers and texts are to be marshalled to deliver the program to groups of students; and 3) those describing the support services and school milieu. *Costs are not intrinsic to the program or curriculum, but depend on choices made about the organization of people and materials which deliver the program and about the buildings and support services which provide space and facilitate delivery of the program message.*

One of the premises of the analysis of costs is that program elements cannot be studied in isolation, and thus the model is not only a means of looking at costs of French, but a technique for examining the costs of any program.

Appendix

TABLE A
COMPARISON OF COSTS OF OUTFITTING IMMERSION AND REGULAR PROGRAM
CLASSROOMS WITH BOOKS AND SUPPLIES, OTTAWA^a, 1976: GRADE TWO

		Per Item	Immersion	Regular
READING				
15	Adventures With Mac	\$ 3.40	\$	\$ 51.00
15	Silver Steps	3.40		51.00
15	Golden Trails	3.40		51.00
1	Lang. Patterns Reading Centre	39.96		39.96
3	Teacher Guides (Bk.2)	7.96		23.88
4	Working With Words	1.56		6.24
15	Picture Dictionaries	3.50		52.50
1 set	The Reading Box	21.46		21.46
15	Rainbow Letters	3.00		45.00
1 set	Independent Activities (Dup.mast.)	23.20		23.20
15	Wings of Wanders	4.20		63.00
1 set	Caisse de Matériel Renouvelable	60.00	60.00	
20	Je Sais Lire	2.38	47.60	
1	Guidebook and Workbook	4.20	4.20	
25	De Belles Histoires	4.25	106.25	
1	Workbook	1.50	1.50	
1	Coin de Lecture	125.00	125.00	
10	Mon Larousse en Images	2.50	25.00	
1	Le Sablier Française 2 (Bk 1&2)	10.00	10.00	
1	Grammaire et Langage	10.50	10.50	
1 set	J'ai du plaisir à lire	13.50	13.50	
1 set	Ouvre d'oeil (10)	22.50	22.50	
	Total Reading		426.05	428.24
	Per Pupil		14.20	14.27
MATHEMATICS				
5	Workbooks (Addison-Wesley, Multimath, Expérimath, etc.)	3.00		15.00
1	Games, concrete aids (Scholar's Choice)	50.00		50.00
25	La Mathématique à l'élémentaire	2.95	73.75	
1	Expérimath #2	3.95	3.95	
1	Project Math	3.00	3.00	
2	Mathématique Niveau	1.60	3.20	
1	Les blocs logiques	15.00	15.00	
	Total Mathematics		98.90	65.00
	Per Pupil		3.30	2.17
SOCIAL STUDIES				
1	Beginner Globe	40.00	40.00	40.00
1	Map of Canada	40.00	40.00	40.00
1	Map of the World	40.00	40.00	40.00
	Total Social Studies		120.00	120.00
	Per Pupil		4.00	4.00
A.V.A.				
1	Record Player	85.00	85.00	85.00
1	Tape Recorder	60.00	60.00	60.00
1	Listening Centre	85.00	85.00	85.00
1	Overhead projector ^b			110.00
	Total A.V.A.		230.00	340.00
	Per Pupil		7.67	11.33

a Based on class of 30

b Also used by immersion class

TABLE B
COMPARISON OF COSTS OF OUTFITTING IMMERSION AND REGULAR
PROGRAM CLASSROOMS WITH BOOKS AND SUPPLIES, OTTAWA, 1976*
GRADE THREE

ENGLISH LANGUAGE ARTS	Per Item	Immersion	Regular
READING			
Ginn Integrated Language Program			
Level Four			
10 All About Me	1.40	14.00	14.00
10 Mugs Scores	1.40	14.00	14.00
10 Carnival	1.40	14.00	14.00
Level Five			
10 Moon Shiny Night	1.40	14.00	14.00
10 Higgleby's House	1.40	14.00	14.00
10 Close Up	1.40	14.00	14.00
Level Six			
10 Bundle of Sticks	1.40	14.00	14.00
10 Topsy Turvy	1.40	14.00	14.00
10 Taking Off	1.40	14.00	14.00
Level Seven			
10 Deep Sea Smile	1.40	14.00	14.00
10 Detective Game	1.40	14.00	14.00
10 Catch a Firefly	1.40	14.00	14.00
Novels			
10 Burma Boy	1.40	14.00	14.00
10 Macaroon	1.40	14.00	14.00
Ginn Interest Series			
1 (pkg of 10) Level 4/5	6.80	6.80	6.80
1 (pkg of 10) Indian Legends	6.80	6.80	6.80
Nelson Venture Books			
1 Level Two - Part A	18.00	18.00	18.00
1 Level Two - Part B	22.00	22.00	22.00
Holt, Rinehart			
10 Across the Country	3.80		38.00
10 Wings of Wonder	3.80		38.00
10 Flights Near and Far	4.40		44.00
SPELLING			
30 Spelling in Language Arts	2.20		66.00
30 Basic Goals in Spelling	1.95	58.50	
DICTIONARIES			
1 My Second Picture Dictionary	5.60	5.60	5.60
1 The Ginn Beginning Dictionary	5.80	5.80	5.80
10 Words and their Meanings	4.25	42.50	42.50
30 Winston Dictionaries	3.96	118.80	118.80
Total English Language Arts		480.80	608.30
Per Pupil		16.03	20.28

* Based on class of 30

cont.

Table B - cont. (1)

FRENCH LANGUAGE ARTS	Per Item	Immersion	Regular
READING			
Méthode de Lecture Spontanée			
10 J'aime Lire (Text)	\$ 3.91	\$ 39.10	\$
1 J'aime Lire (Guide)	1.20	1.20	
10 J'aime Lire - Je compose mon dictionnaire	1.20	12.00	
10 J'aime Lire - cahier d'exercices	1.70	17.00	
Série Feuille d'Erable			
10 Contes et Poèmes - livre de l'élève	4.25	42.50	
10 Contes et Poèmes - cahier d'exercices	1.50	15.00	
1 Guide	3.00	3.00	
6 La famille heureuse	2.52	15.12	
6 De surprise en surprise	3.24	19.44	
6 Encore des surprises	3.24	19.44	
6 Histoires et contes amusants	3.08	18.48	
1 La grammaire à l'école active	1.65	1.65	
30 Cahier de grammaire	3.50	105.00	
1 Vocabulaire Oral des Enfants	5.50	5.50	
1 Le Sablier - Français 3 ^{er} livre	5.95	5.95	
1 Le Sablier - Français 3 ^e livre	5.95	5.95	
1 Disque 3	7.25	7.25	
Un Pas en Avant			
30 Pupils workbooks	2.60		78.00
Savoir Lire			
1 Module 1	59.00	59.00	
1 Module 2 (complet)	64.00	64.00	
1 Module 3 (complet)	64.00	64.00	
De la langue parlée à la langue écrite			
30 livre de l'élève	2.16	64.80	
1 livre du maître	6.90	6.90	
1 Grammaire et langage Tome 2	10.95	10.95	
1 Je découvre la grammaire et l'orthographe par des méthodes actives	4.90	4.90	
DICTIONARIES			
1 Des mots, des phrases, des images	8.50	8.50	8.50
1 Mon grand vocabulaire	2.50	2.50	2.50
1 Mon Larousse en images	6.08	6.08	6.08
30 Larousse des débutants	3.95	118.50	
Total French Language Arts		743.71	95.08
Per Pupil		24.79	3.17

cont.

Table B - cont. (2)

	Per Item	Immersion	Regular
MATHEMATICS			
La mathématique à l'élémentaire			
30 Livre de l'élève	7.01	210.30	
1 Livre du Maître	13.55	13.55	
1 Experimath No. 3	3.95	3.95	
1 Set - Les blocs logiques (complet)	35.00	35.00	
Investigating School Math			
30 Texts	6.58		197.40
1 Guide	10.20		10.20
1 Mathways 3	5.50		5.50
1 Project Math SI Metric 3	5.40		5.40
1 We Measure Length - Book 1	1.50		1.50
Total Mathematics		262.80	220.00
Per Pupil		8.76	7.33
SCIENCE			
1 Les chemins de la Science - Livre 3	6.60	6.60	
1 Les chemins de la Science - Guide	9.80	9.80	
1 Science, Environment & Man - pupil	4.50	4.50	4.50
1 Science, Environment & Man - guide	5.50	5.50	5.50
Total Science		26.40	10.00
Per Pupil		.88	.33
SOCIAL STUDIES			
1 L'ABC de la géographie 3e (pupil)	1.65	1.65	
1 " " " " " (guide)	1.95	1.95	
1 Globe		21.95	21.95
1 Map of the World		37.95	37.95
1 Map of Canada		37.95	37.95
30 Atlas (Holt)	8.25	247.50	
30 Atlas (Nelson)	3.76		112.80
Total Social Studies		348.95	210.65
Per Pupil		11.63	7.02
MUSIC			
1 Chants de jeux français	1.20	1.20	
1 Mon école chante 3e année	1.25	1.25	
15 Songtime 3	3.40		51.00
Total Music		2.45	51.00
Per Pupil		.08	1.70
A.V.A.			
1 Listening Centre		85.00	85.00
1 Cassette		60.00	60.00
1 Record Player		85.00	85.00
Total A.V.A.		230.00	230.00
Per Pupil		7.67	7.67
DAY SCHOOL SUPPLIES - Stock Room & Phys. Ed.			
based on total amount spent - per pupil 12.33		369.90	369.90

TABLE C

COMPARISON OF COSTS OF OUTFITTING IMMERSION AND REGULAR
PROGRAM CLASSROOMS WITH BOOKS AND SUPPLIES, OTTAWA, 1976*

GRADE FOUR

	Per Item	Immersion	Regular
FRENCH LANGUAGE ARTS			
De la langue parlée à la langue écrite			
8 - élève	2.60	20.80	
1 - maître	3.95	3.95	
12 Le Bon Temps	3.96	47.52	
4 Cahier d'activités	1.70	6.80	
15 Cassettes	approx. total	10.00	
1 Lecture guide - Le Bon Temps	3.00	3.00	
<u>Langue Française</u>			
6 Fiches 1ère partie	1.26	7.56	
1 Fiches 1ère partie - maître	2.70	2.70	
6 Fiches 2e partie	1.26	7.56	
1 Fiches 2e partie - maître	2.70	2.70	
1 Guide du maître	4.15	4.15	
1 Code grammatical	.70	.70	
1 Série de 20 disques		15.00	
1 Atelier de lecture "A"		55.00	
30 Atelier de lecture "A" cahier élève	.90	27.00	
<u>J'apprends à connaître la langue française - 4e année</u>			
6 Livre I	4.50	27.00	
6 Livre II	4.50	27.00	
<u>Collection Prenons la Parole</u>			
1 Guide du maître	5.50	5.50	
6 Mowgli	2.13	12.78	
4 Fascicule de Mowgli	.80	3.20	
1 Livre de la jungle (livre disque)	1.61	1.61	
1 Les nouvelles aventures de Mowgli (livre disque)	1.61	1.61	
1 Bambi et Pam-Pam (livre disque)	1.61	1.61	
1 Pinocchio (livre disque)	1.61	1.61	
1 Le vilain petit canard (livre disque)	1.61	1.61	
<u>Deuxième cycle de l'élémentaire</u>			
1 Fiches #1	1.15	1.15	
1 Fiches #2	1.95	1.95	
1 Fiches #3	1.95	1.95	
1 Notes Méthodologiques 4e année	5.00	5.00	
1 Savoir Lire - Module II (niveau 2,3,4)	49.50	49.50	
1 Livre 1 - Le Français à l'école active	4.00	4.00	
1 La grammaire à l'école active	1.60	1.60	
1 Le Langage à l'école active			
1 La lecture à l'école active	3.36	3.36	

*based on class of 30

Table C - cont. (1)

	Per Item	Immersion	Regular
Savoir Parler - Savoir Ecouter			
Blocs SP - SE			
1 1A Présentation	2.15	2.15	
1 3A Dictionnaire Mon Ami	4.65	4.65	
1 5A Dialogue	4.65	4.65	
1 6 Illustration - Vocabulaire	8.35	8.35	
1 10A Audition	4.65	4.65	
1 13A Lecture	2.15	2.15	
1 14A Animaux	4.65	4.65	
1 Coin de Lecture 4 (complet)		158.00	
Arnold le hamster			
10 - élève	1.25	12.50	
1 - maître	3.95	3.95	
Dictionnaires			
30 - Larousse des débutants	3.95	118.50	
8 - Micro-Robert	8.95	71.60	
5 - L'art de conjuguer de bescherelle (Dupuis)	2.40	12.00	
1 - Dictionnaire de synonymes et antonymes (Bénar)	13.60	13.60	
Total French Language Arts		787.88	NA
Per Pupil		26.26	
ENGLISH LANGUAGE ARTS			
Ginn Reading Program			
20 Starting Points in Language A (student)	4.32	86.40	
20 Starting Points in Language B (student)	4.32	86.40	
Starting Points in Reading A			
15 - 1st Book	4.08	61.20	
15 - 2nd Book	4.08	61.20	
Starting Points in Reading B			
15 - 1st Book	4.08	61.20	
15 - 2nd Book	4.08	61.20	
Starting Points in Reading C			
5 - 1st Book	4.08	20.40	
5 - 2nd Book	4.08	20.40	
15 Winston Canadian Dictionary for Schools	4.40	66.00	
30 Spelling - Word Family - Book 4	1.98	59.40	
Novels will be borrowed from the English Consultant as needed.			
1 SRA Reading Lab IIa		150.00	
30 Pupil booklets	.90	27.00	
20 Hockey Cards and Hopscotch	3.40	68.00	
20 Over The Bridge (Reader)	3.84	76.80	
15 Driftwood and Dandelions	3.40	51.00	
15 Heights Near and Far	4.40	66.00	

cont.

Table C - cont. (2)

	Per item	Immersion	Regular
English Language Arts (Cont.)			
30 Developing Comprehension in Reading	2.35		70.50
Teachers Manuals for:			
1 - Over the Bridge	3.75		3.75
1 - Heights Near and Far	3.75		3.75
1 - Driftwood and Dandelions	4.25		4.25
1 - Hockey Cards and Hopscotch	4.25		4.25
30 Dictionary Winston Canadian	3.96		118.80
30 Developing Language Skills	3.96		118.80
30 Spelling in the Language Arts	2.20		66.00
30 Space Book	1.48		44.40
20 Galaxy Book	1.48		29.60
Teachers Reference Books			
1 - Starting Points - Language A	4.32		4.32
1 - Starting Points - Reading A	4.08		4.08
1 - SRA Spelling Workbook	2.10		2.10
1 - Golden Press Poetry	3.80		3.80
1 - Dictionary Skills Workbook	2.70		2.70
1 - Reading and Thinking Skills 4	3.35		3.35
1 - Multiworlds - Nelson	3.88		3.88
Total English Language Arts*		533.80	922.88
Per Pupil		19.46	30.76
MATHEMATICS			
La mathématique à l'élémentaire			
30 - Livre élève	5.91	177.30	
1 - Livre maître	14.45	14.45	
30 Discovering Modern Mathematics	4.72		141.60
2 Number Patterns	5.56		11.12
1 Spectrum Math 4	2.25		2.25
Total Mathematics		191.75	154.97
Per Pupil		6.39	5.16
SCIENCE			
Les chemins de la science			
3 - Livre 4 - élève	6.60	19.80	
1 - Livre 4 - maître	9.80	9.80	
1 Science in Action	3.95		3.95
1 Investigating Science 3	3.25		3.25
Total Science		29.60	7.20
Per Pupil		.99	.24

* does not include teacher's reference books for English to immersion.

Cont.

Table C - cont. (3)

	Per Item	Immersion	Regular
SOCIAL STUDIES			
30 Atlas Général (Holt)	9.56	286.80	
30 Canadian Junior Atlas (Nelson)	3.10		93.00
20 Global Village	5.08		<u>101.60</u>
Total Science		286.80	194.60
Per Pupil		9.56	6.49
MUSIC			
1 Chansons canadiennes-françaises	1.95	1.95	
1 Chansons du Québec	2.50	<u>2.50</u>	
Total Music		4.45	NA
Per Pupil		.15	

TABLE D
COMPARISON OF COSTS OF OUTFITTING IMMERSION AND REGULAR
PROGRAM CLASSROOMS WITH BOOKS AND SUPPLIES, OTTAWA, 1976*
GRADE FIVE

	Per Item	Immersion	Regular
ENGLISH LANGUAGE ARTS			
30 MacMillan Spelling Series 5	\$ 2.52		\$ 75.60
12 Starting Points in Read. B I	4.08	48.96	
B II	4.08	48.96	
12 Northern Lights	4.25		51.00
12 Kites and Cartwheels	4.25		51.00
15 Dictionaries	3.96		59.40
30 Eng.Lang. Text (Starting Points)	4.32		129.60
Total English Language Arts		97.92	366.60
Per Pupil		3.26	12.22
FRENCH LANGUAGE ARTS			
10 L'invitation au Voyage	4.40	44.00	
15 Aux Quatre Vents	3.96	59.40	
30 Cahier d'élève	1.00	30.00	
10 Langue Française	4.14	41.40	
15 Dictionnaire	3.50	52.50	
Total French Language Arts		227.30	NA
Per Pupil		7.57	
MATHEMATICS			
30 La mathématique à l'élémentaire	8.25	247.50	
30 Project Math.	5.40		162.00
Total Mathematics		247.50	162.00
Per Pupil		8.25	5.40
SUPPLIES - No difference			
REFERENCE			
1 Globe	19.75		19.75
1 Globe	19.75	19.75	
3 Wall maps	31.95		95.85
3 Wall maps	33.50	100.50	
10 Atlas	2.50		25.00
10 Atlas	8.95	89.50	
1 Encyclopedia	239.50		239.50
1 Encyclopedia	289.50	289.50	
1 Pupil's Science Text	6.50		6.50
1 Pupil's Science Text	6.60	6.60	
1 S.R.A. Lab	158.00	158.00	
1 S.R.A. Lab	129.50		129.50
1 Sec. St. Book (Eastern Hemisphere)	5.08		5.08
Total Reference		664.05	521.18
Per Pupil		22.14	17.36

* based on class of 30

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